Eng

THE LARGEST MECHANICAL CIRCULATION IN THE WORLD

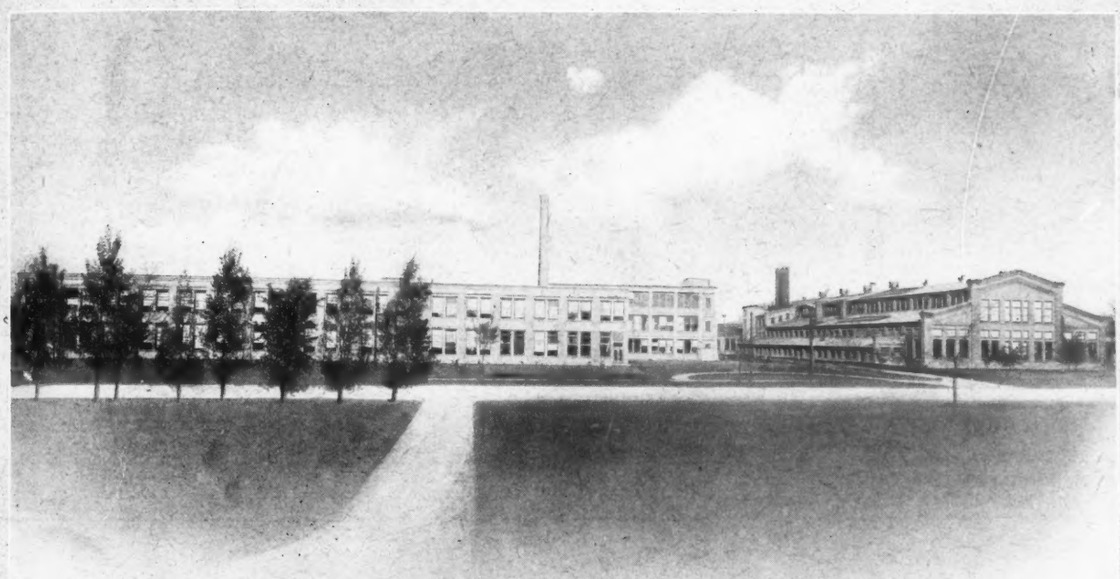
MACHINERY

PUBLICATION OFFICES 49-55 LAFAYETTE STREET, CORNER LEONARD, NEW YORK

VOL. 19. NO. 12
ENGINEERING EDITION

AUGUST 1913

$2.00 A YEAR



FACTORY EQUIPPED FOR MAKING

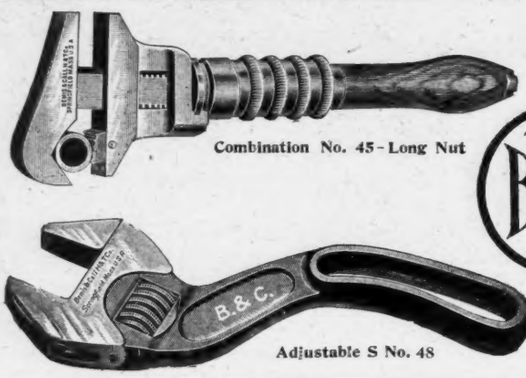
BEVEL GEAR PLANERS
BEVEL GEARS

CAPACITY { Bevel Gears - - 1 inch to 16 feet
Spur Gears - - 1 inch to 20 feet

GLEASON WORKS

ROCHESTER, N. Y.

ADVERTISERS INDEX, PAGE 238—PRODUCT INDEX, 224-236



Combination No. 45 - Long Nut

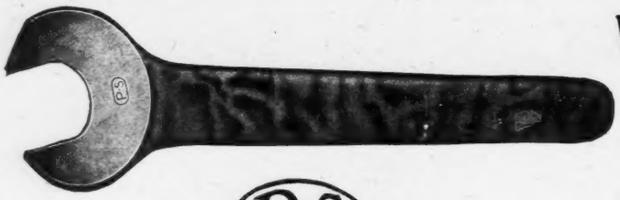
Adjustable S No. 48

TRADE B&C MARK

Is There a B & C Wrench Within Easy Reach?

When you reach for a wrench, bring back a B & C. They're found on the benches of up-to-date mechanics everywhere; they do not break down under the strain of rush work; are strong-backed, grip positively; best in the long pull and can be always relied upon. Just try a B & C wrench and see why we so fully warrant them. Catalogue?

BEMIS & CALL HARDWARE AND TOOL COMPANY
SPRINGFIELD, MASS., U. S. A.



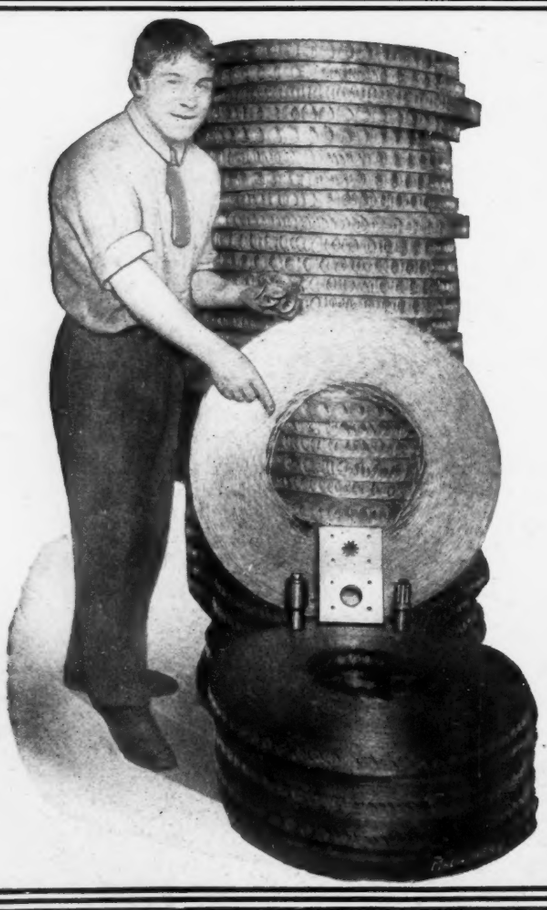
P-S

When you Buy a Drop-forged Wrench

Get one that is strong, but light; made from the best materials procurable, in the best manner possible—get one stamped with the "P-S" trademark. You can then feel sure you have the "right wrench" and go ahead with the assurance which good tools give. Our wrenches are drop forgings of the highest grade. We make special forgings to order, also. Ask about our work. We like to hear from interested people.

Ask for Catalogue M when writing.

PAGE-STORMS DROP FORGE CO.
Chicopee, Mass., U. S. A.



These Are the Vanadium Steel Dies

That ran for three days without grinding on 1/16 inch sheet steel wedge washers.

The stock was fed through the press at the rate of 155 strokes a minute.

Pulling down tools, grinding and setting them up again often takes as much time as the actual cutting.

All this lost time is saved when you can run for three days steady, as the Worth Wedge Washer Company, of Waltham, does with Vulcan Special Vanadium Tool Steel Dies.

"FACTS" DISCUSSES THE ADVANTAGES OF VANADIUM TOOL STEEL. WRITE FOR COPY.

LET US SEND YOU THE NAMES OF VANADIUM TOOL STEEL MAKERS.

AMERICAN VANADIUM COMPANY
325 Vanadium Building, PITTSBURGH, PA.

S

ID
ES
M
L

TY
PA.

21" Drill Sensitive

550 lbs.

EXCLUSIVE BUILDERS OF HIGHEST GRADE UPRIGHT DRILLING MACHINES

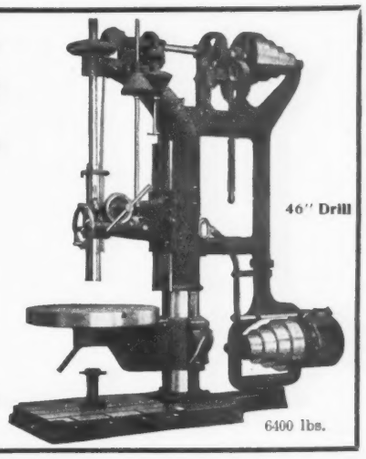
"SNYDER OR EQUAL"

SPECIFIED BY U. S. GOVERNMENT FOR USE IN NAVY YARDS, ALSO REPAIR SHIPS. FOR QUALITY, AND AMOUNT OF WORK, ALSO LONG LIFE OF WEARING PARTS, THESE DRILLS HAVE NO SUPERIOR.

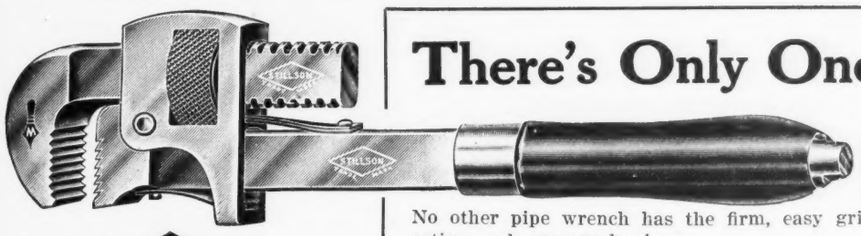
MANNING, MAXWELL & MOORE, Inc., Selling Agents

J. E. SNYDER & SON, Worcester, Mass.

Sizes 20", 21", 23", 25", 28", 30", 36" and 46".


46" Drill

6400 lbs.



There's Only One "Stillson"

and that carries the name in the diamond trade mark —your protection and our guarantee.

No other pipe wrench has the firm, easy grip and the simple one-hand action—ask any mechanic.

Look for the name "Stillson" on the wrench when you buy.

TRADE MARK STILLSON REGISTERED U.S. PATENT OFFICE

Walworth Manufacturing Company

128-136 Federal St., BOSTON, MASS., U. S. A.

New York Office, 42 Broadway

AGENTS: Aug. Eggers, Bremen, Germany; H. Munzing, 180 Upper Thames St., London, Eng.

THE NUT IS ENCOMPASSED ON ALL SIDES BY WRENCH HEAD

Do You Realize What This Means?

It saves the slipping of the wrench on the nuts, the uncertain motion of the ordinary open-end wrenches. The

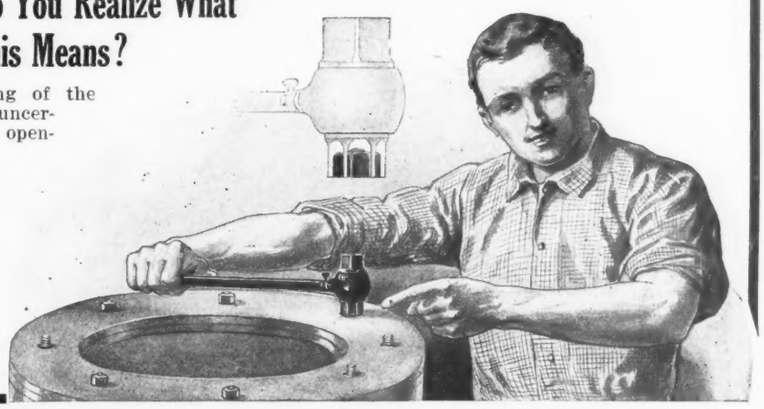
"Favorite" Reversible Ratchet Wrench

brings nut-turning as near 100% efficiency as possible.

With the "Favorite" you can rely upon saving time and damage to the nuts.

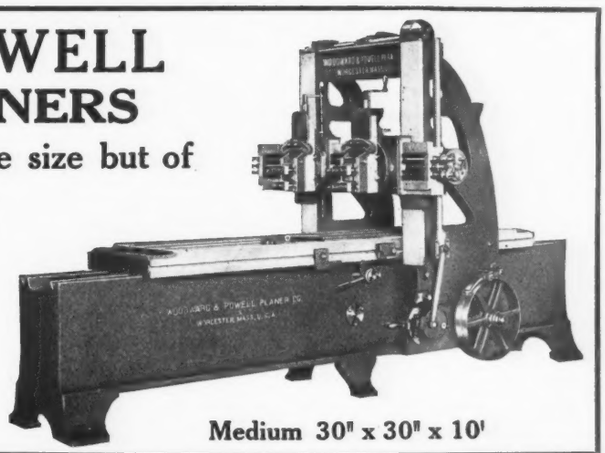
GREENE, TWEED & CO., Sole Manufacturers

109 Duane Street NEW YORK



WOODWARD & POWELL MEDIUM DUTY PLANERS

are designed to machine parts of large size but of light weight. Our heavy duty Planers will meet all requirements of heavier work.


Medium 30" x 30" x 10'

WOODWARD & POWELL PLANER COMPANY

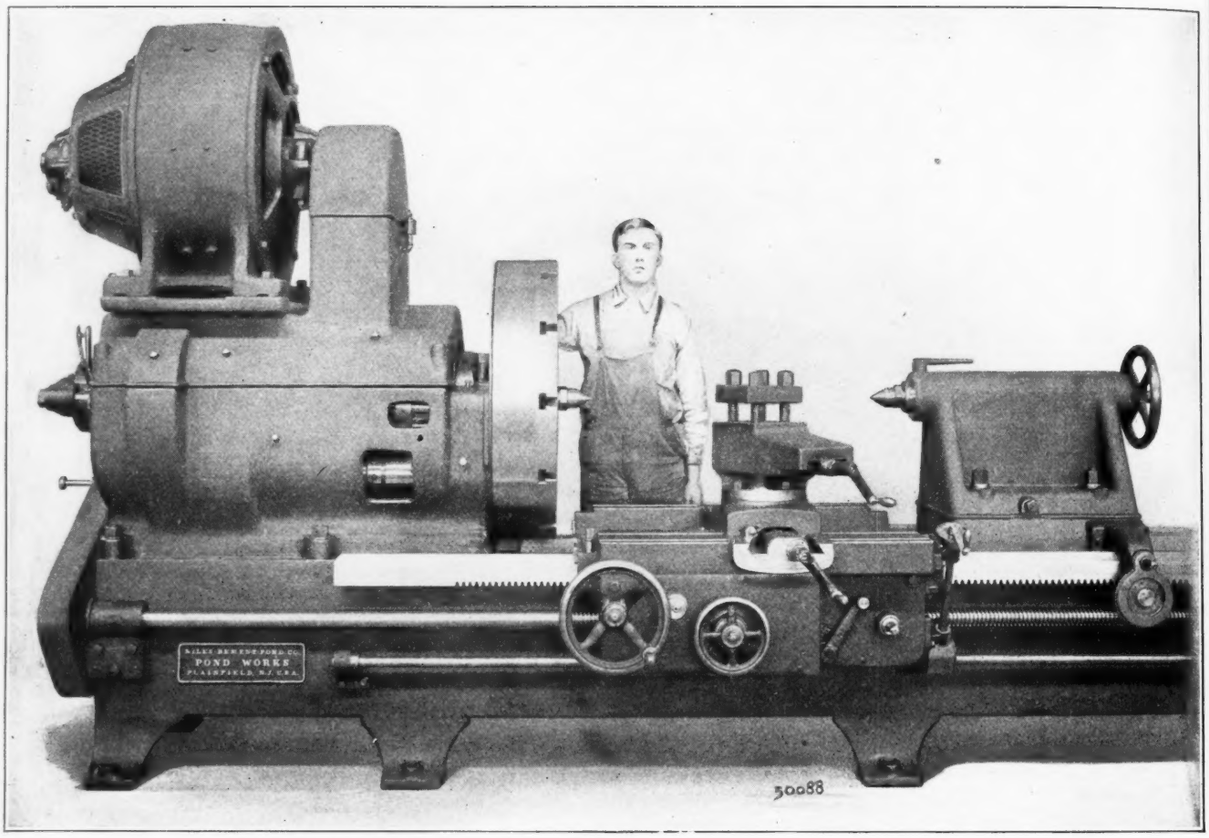
WORCESTER, MASSACHUSETTS, U. S. A.

AGENTS: Manning, Maxwell & Moore, Inc., New York, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Detroit, Milwaukee, Philadelphia, Pittsburgh, St. Louis, San Francisco. Alexander & Garsed, Charlotte, N. C. The Allied Machinery Co. of America, Paris, France; Brussels, Belgium.

If You Have Heavy Turning

and want to get out your work as fast as possible and with the best results, there is one combination that will surely do it

Use High Speed Steel Tools and POND LATHES



Simple and Effective Design

Pond Lathes possess all features required for efficient maximum output without sacrificing simplicity of design. They will work your high-speed tools right up to the limit without vibration or yielding. The weight is ample and carefully distributed, as our long experience has taught to be essential. The spindle bearings are large and bronze lined. The carriage has an exceptionally large bearing on the bed.

As the tool does not overhang the bed the full driving power can be used when turning work of larger diameter.

Handy Features About the Carriage

On motor-driven lathes the speed may be varied through a wide range by the handle on the right side of the carriage. Thus the operator does not have to leave his work and is more apt to use the proper speed for his job.

By simply tightening up the small handwheel in the proper direction, the cross or longitudinal feeds are thrown in and only one can be in operation at a time. The feeds can be reversed at the carriage. The feed and screw cutting mechanisms are interlocking so that both cannot be engaged at the same time.

Have you one of our catalogs, "Heavy Lathes?" If not, drop us a line.

111 Broadway, New York, U. S. A. **NILES-BEMENT-POND CO.** **23-25 Victoria Street London, S. W.**

Sales Offices and Agencies: Boston, 93-95 Oliver St. Philadelphia, 21st and Callowhill Sts. Pittsburgh, Frick Bldg. Cleveland, The Niles Tool Works Co., Rockefeller Bldg. Hamilton, O., The Niles Tool Works Co. Detroit, Majestic Bldg. Chicago, McCormick Bldg. St. Louis, 516 Nc. Third St. **Agent for Gulf States,** N. C. Walpole, Brown-Marx Bldg., Birmingham, Ala. **Agents for Colorado,** Hendrie & Bolthoff Mfg. and Supply Co., Denver. California, Nevada and Arizona, Harron, Rickard & McCone, San Francisco and Los Angeles. Washington and Idaho, Hallidie Machinery Co., Seattle and Spokane. For Oregon, Portland Machinery Co., Portland.

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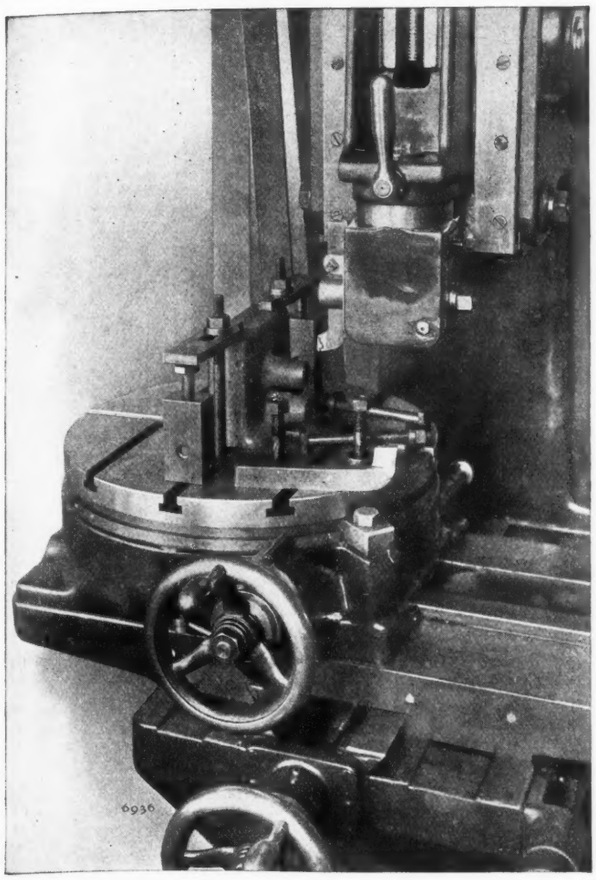


Have You Work Requiring Perfectly Parallel Surfaces?

The swiveling ram head on the

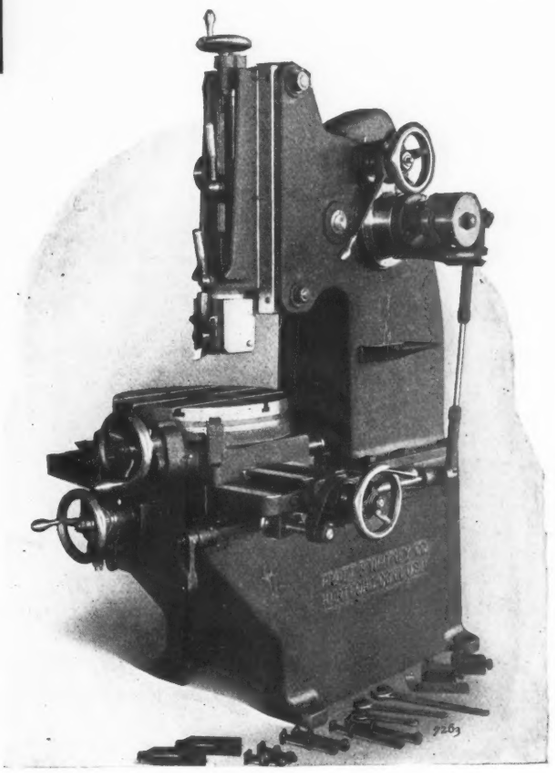
P. & W. VERTICAL SHAPER

will enable you to finish the job complete without changing the original setting and with a high degree of accuracy.

Here's the Way the Vertical Shaper Handles Square or Parallel Work

The ram head is set in the most advantageous position for the first side to be machined and is then firmly clamped. After finishing this side, the head is swiveled through 90 degrees or 180 degrees, as the case may be. The table is then fed in the proper direction, the machine being provided with automatic quick-acting feeds. By this method of swiveling the tool instead of the work the accuracy of the parallel or square sides does not depend upon the setting of the table, but on the alignment of the machine. On long, awkward jobs this method is especially convenient.

Write for illustrated circular "Vertical Shaper."



PRATT & WHITNEY CO., Hartford, Conn.

A Stock of Pratt & Whitney Machinists' Small Tools carried in the following cities:

NEW YORK.....326 Hudson St.
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BIRMINGHAM, ALA.
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SAN FRANCISCO
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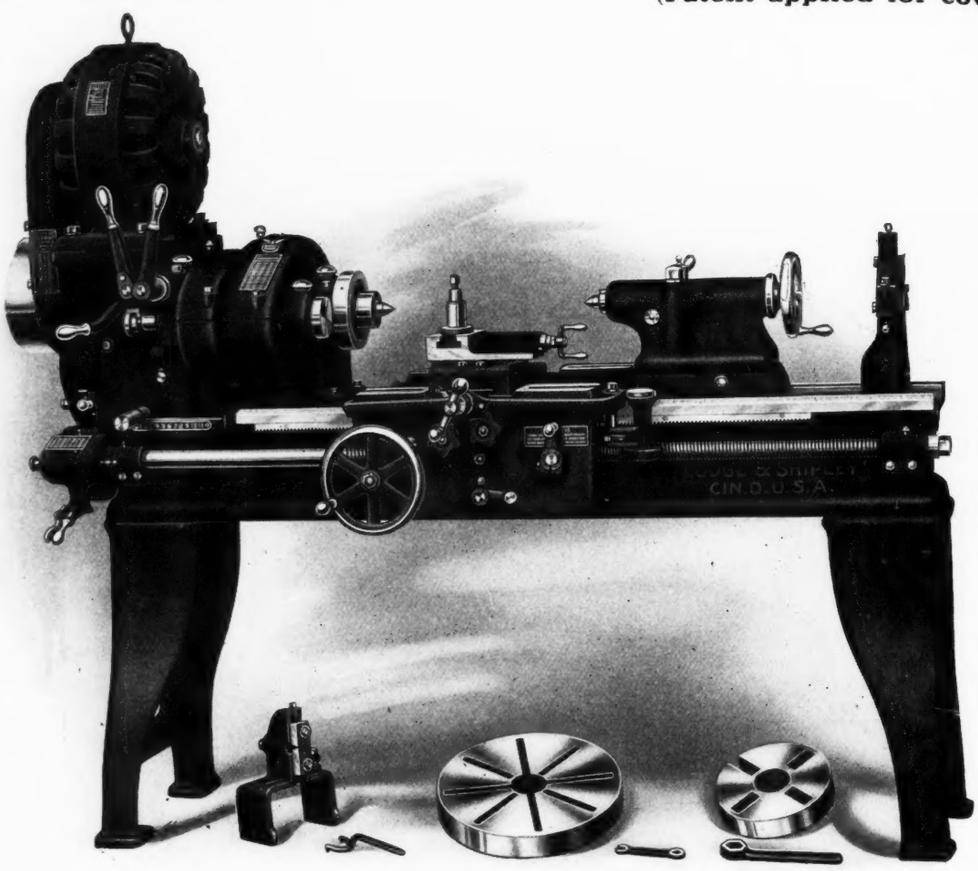
SPOKANE.....Hallidie Co., Inc.
SEATTLE, WASH.
Hallidie Machinery Co.

LOST! The Small Shoul

(Patent applied for covering



14-inch Motor Driven "Selective Head" Lathe

The double spindle nose of the "Selective Head" Lathe provides a large face against which the chuck plate or face plate is drawn; the large diameter of this face affords a longer lever arm to resist the torque. This prevents the plate "freezing" to the spindle nose and squeezing the shoulder out of true, as sometimes happens with noses of standard construction.

The two portions of the double nose are an inner cylindrical pilot and an outer cup. The cup is threaded internally to hold the chuck plate in position and the end is faced. The cylindrical pilot is left blank its entire length and extends beyond the cup to receive the face plate and to center it exactly before the threaded portion is reached.

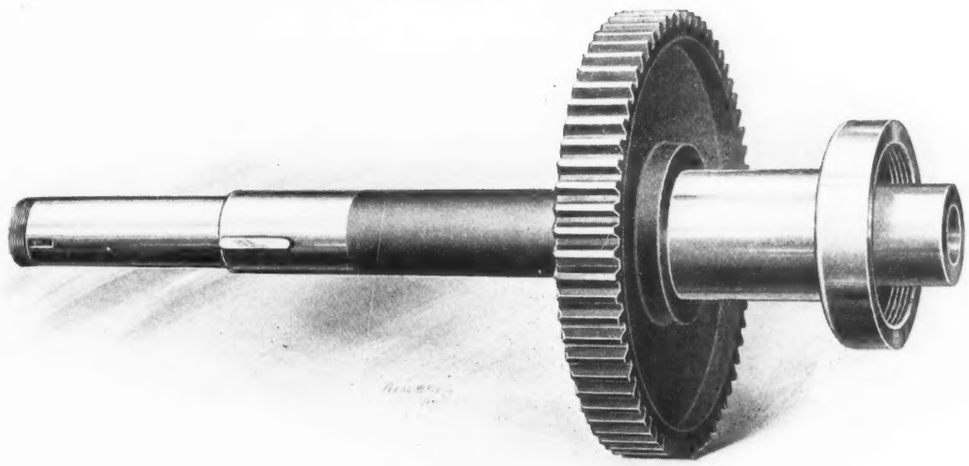
Investigate the chrome nickel steel heat treated gears, ball bearings and many other advantages of the new "Selective Head" Lathe.

THE LODGE & SHIPLEY MACHINE

DOMESTIC AGENTS: Brown & Zortman Machinery Co., Pittsburgh; Charlotte Supply Co., Charlotte; Colcord-Wright Mchy. & Supply Co., St. Louis; Dewstoe Machine Tool Co., Birmingham; Hallidie Machinery Co., Seattle; The Hallidie Co., Spokane; Harron, Rickard & McCone, San Francisco, Los Angeles; Hendrie & Bolthoff Mfg. & Supply Co., Denver; Kemp Machinery Co., Baltimore; Marshall & Huschart Machinery Co., Chicago and Indianapolis; Motch & Merryweather Machinery Co., Cleveland, Detroit; C. T. Patterson Co., Ltd., New Orleans; Prentiss Tool & Supply Co., New York, Boston, Buffalo, Syracuse, Rochester; Robinson, Cary & Sands Co., St. Paul, Duluth; W. E. Shipley Machinery Co., Philadelphia; Galligher Machinery Co., Salt Lake City, Utah. Zimmerman-Wells-Brown Co., Portland, Ore.

der of the Spindle Nose

this new Spindle Nose)



Spindle with face gear, showing Spindle Nose

A chuck can be readily mounted on the spindle without having first to hold it straight with the threads while the spindle is being rotated by hand, and can be wound into place against the face of the cup with perfect ease.

It is a comparatively simple matter to accurately fit a chuck plate to this spindle, as the bore may be reamed standard size to fit the pilot. The threading of the chuck plate is easily done, as it is a job of external threading and the thread is used only to hold the plate in position against the face of the cup.

Spindle noses of "Selective Head" lathes from 14″ to 20″, inclusive, are made to the same standard so that chucks will interchange from one lathe to another between these sizes. Similarly another standard is used for all lathes from 22″ to 36″. As the larger lathes are triple geared, there are but the two standards of spindle noses for the entire range of sizes.

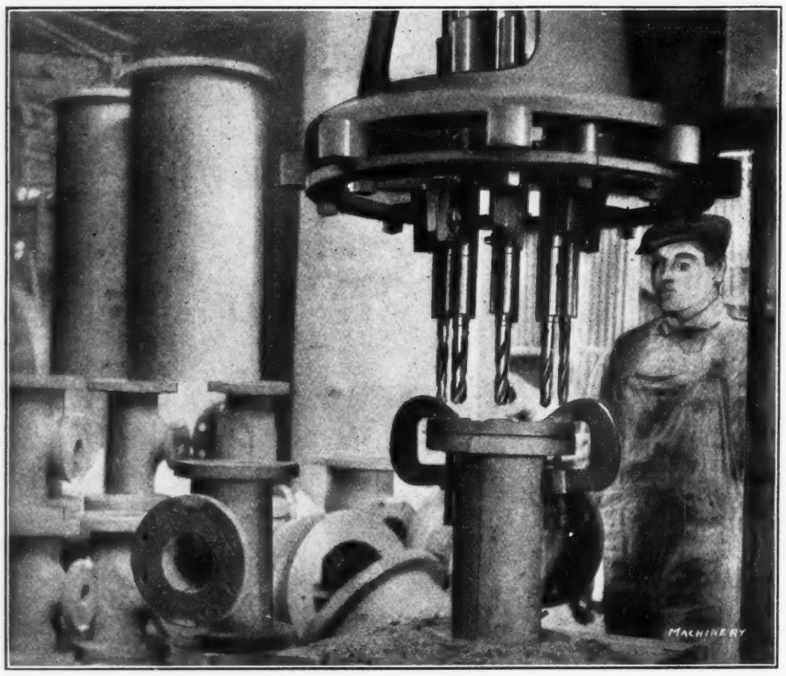
The "Selective Head" provides twelve mechanical changes of spindle speed suitable for constant speed belt or motor drive.

TOOL COMPANY, CINCINNATI, OHIO

EUROPEAN AGENTS: Alfred Herbert, Ltd., Coventry, England, Berlin, Germany; V. Lowener, Copenhagen, Christiania, Stockholm; Donauwerk Ernst Krause & Co., Vienna, Prague, Budapest; R. S. Stokvis & Zonen, Ltd., Amsterdam, Rotterdam, Groningen, Brussels, Paris. Scheufelberger Co., Zurich; Schuchardt & Schutte, St Petersburg and Helsingfors; W. Vogel, Milan.

OTHER AGENTS: Andrews & George, Yokohama; Bevan & Edwards Prpty., Ltd., Melbourne; Krajewski-Pesant Co., Havana; Mussens, Ltd., Montreal, Toronto, Cobalt, Winnipeg, Calgary, Vancouver.

Multiple Drilling on the Baush "Multiple"



Here are two examples of multiple drilling efficiency that we'll wager you can't equal—unless Baush Multiple Spindle Drilling Machines form a part of your equipment. The piled-up work in the photograph consists of cast-iron flanges 1¼ inch thick, each requiring eight 1-inch through holes. This work is drilled at the rate of 25 pieces per hour, and as each flange has eight holes a total of 200 holes per hour is the output.

The drilling of pipe-fitting flanges, as shown in the other operation, requires a template to guide the drills, eight holes being drilled in each end of the fitting. This work is being done at the Lumsden & Van Stone factory in South Boston, Mass., the concern that installed the steam piping in the Hotels Astor, Martinique and other large buildings in New York and other cities, and Baush Multiple Drilling Machines have been drilling equipment at this plant for a number of years. Besides adaptability and flexibility, another advantage reported by this concern is extremely low repair and upkeep costs—points it will pay to remember when you buy drilling machines.

Various sizes and types. Spindles from two to twenty-four. Any layout desired, regular or irregular. Send for the catalogue.

BAUSH MACHINE TOOL COMPANY

200 WASON AVENUE

SPRINGFIELD, MASS.

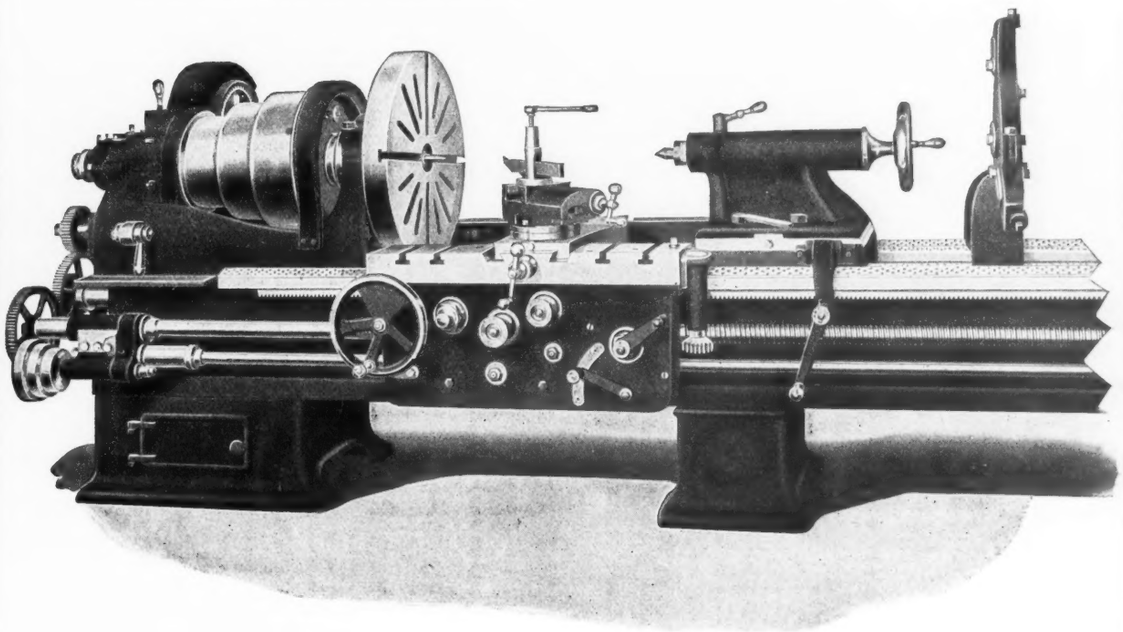
CHICAGO OFFICE—McCormick Building

NEW YORK OFFICE—50 Church Street

AGENTS: Fenwick Freres & Co., France, Holland, Belgium, Switzerland, Italy, Spain, Portugal. F. G. Kretschmer & Co., Vienna, Frankfurt a/M., Budapest. Selson Engineering Co., London.

Bradford Engine Lathes

In this 28″ heavy, powerful Bradford Engine Lathe are embodied features which adapt it especially to severe and exacting work. Workmanship and materials are of the best and each lathe must pass a rigid working examination before it is shipped to a customer.



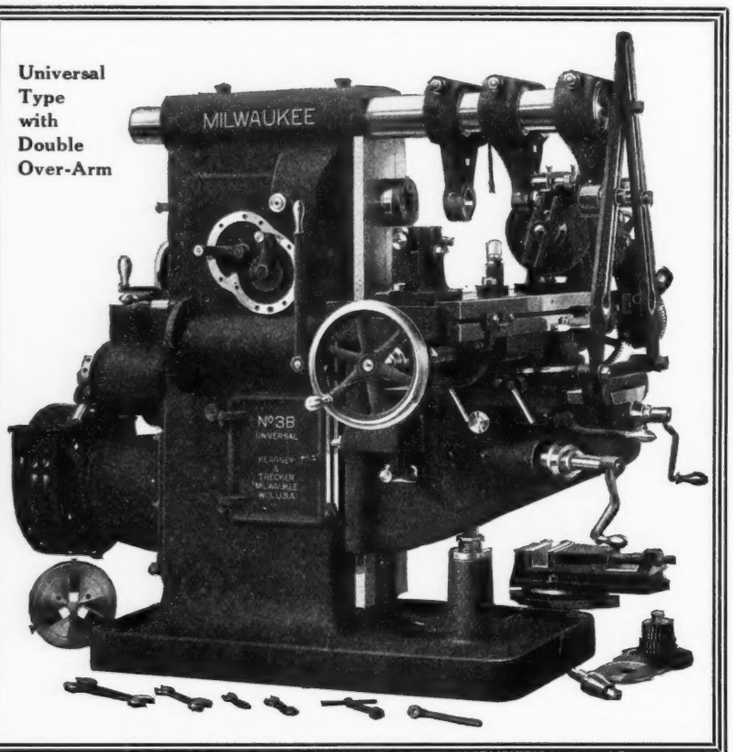
A well-ribbed headstock, clamped securely to prevent chattering, together with the special High Carbon Crucible Steel Spindle, bored from the solid, and the lead screw which is cut from a master screw, add a distinctiveness to Bradford Engine Lathes which appeals.

Three-step cone pulley and double back gears are features of the 28″ "Bradford" which increase capacity and simplify control. Do you want to know more about this "Bradford" —or the 14, 16, 18, 18 heavy pattern, 20, 22, 24, 26, 30, 32, 36 and 42 inch sizes? Very complete bulletins mailed on request.

The Bradford Machine Tool Company

Cincinnati, Ohio

AGENTS: Swind Machinery Co., Philadelphia. Hill, Clarke & Co., New York. Taylor Machinery Co., Boston, Mass. The H. A. Stocker Machinery Co., Chicago, Ill. Marshall & Huschart Machinery Co., St. Louis, Mo. Somers, Fitler & Todd Co., Pittsburgh, Pa. E. A. Kinsey Co., Cincinnati, O., and Indianapolis, Ind. The Mine & Smelter Supply Co., Denver, Colo. Pacific Tool & Supply Co., San Francisco, Cal. F. W. Horne, Yokohama, Agent for Japan, China and the Far East. Chas. Churchill & Co., Ltd., London, Birmingham, Glasgow, Newcastle-on-Tyne. Donauwerk Ernst Krause & Co., Vienna, Budapest and Prague. Alfred H. Schutte, Cologne, Berlin, Brussels, Milan, Paris, Barcelona, St. Petersburg, Denmark, Sweden and Norway.



Universal Type with Double Over-Arm

Selection by Elimination Sells Milwaukee Millers

Neither you nor any other discriminating buyer who wants absolutely the best would buy any equipment without exhaustive investigation.

Neither we nor any other manufacturer who has absolute confidence in his product would ask you to buy without making such an investigation.

An exhaustive investigation—point by point—of all milling machines can lead to but one decision by the discriminating buyer —MILWAUKEE MILLERS.

Digest these facts—

Double Over-Arms, our latest and greatest improvement, provide a rigid truss which positively aligns the cutter arbor and keeps it true. Also makes it impossible for cutters to pound the bearing gradually out of line. Furthermore, it permits the use of large, coarse pitch cutters on rough, heavy work at a much greater distance from the column.

Arrangement of *control* such that no two feeds can be accidentally placed in operation at one time.

The strong *box-form knee* is made still stronger and more rigid by making it with solid, not slotted, top.

The column is cast in ONE piece, box section, with strong internal ribs.

Flanged spindle with notched clutch collar keyed to its face, dogs on arbor fitting securely into the notches. This prevents slipping of the arbor in the spindle under heavy work.

Cascade system of lubrication of all bearings by which a flood of running oil keeps bearings not only fully lubricated, but flushes them of all grit or foreign substances.

These and other equally important facts, fully amplified in our Bulletins, we submit to everyone interested in milling machines for an exhaustive investigation.

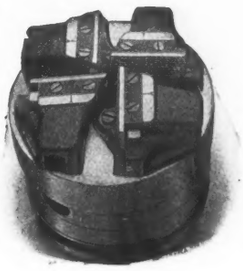
Send for Our Literature

KEARNEY & TRECKER COMPANY

MILWAUKEE, WISCONSIN, U. S. A.

We Give You Gratis An Increase in Production When You Purchase A Landis Bolt Cutter

It's purely and simply a case of superiority in design—a careful investigation will convince you.



Landis Dies have

twenty times the life of the ordinary hobbed type because of the length of chasers.

One hundred per cent. greater cutting speed, due to the flexible rake and line contact between chasers and work.

Perfect interchangeability; that is, any one or more of a set can be replaced without renewing the entire die.

A permanent cutting contour because the chasers are ground at the front end and never on the beveled surface of this chaser that forms the throat of the die.

Further

The chasers are hard their entire length and never require annealing, hobbing or retempering.

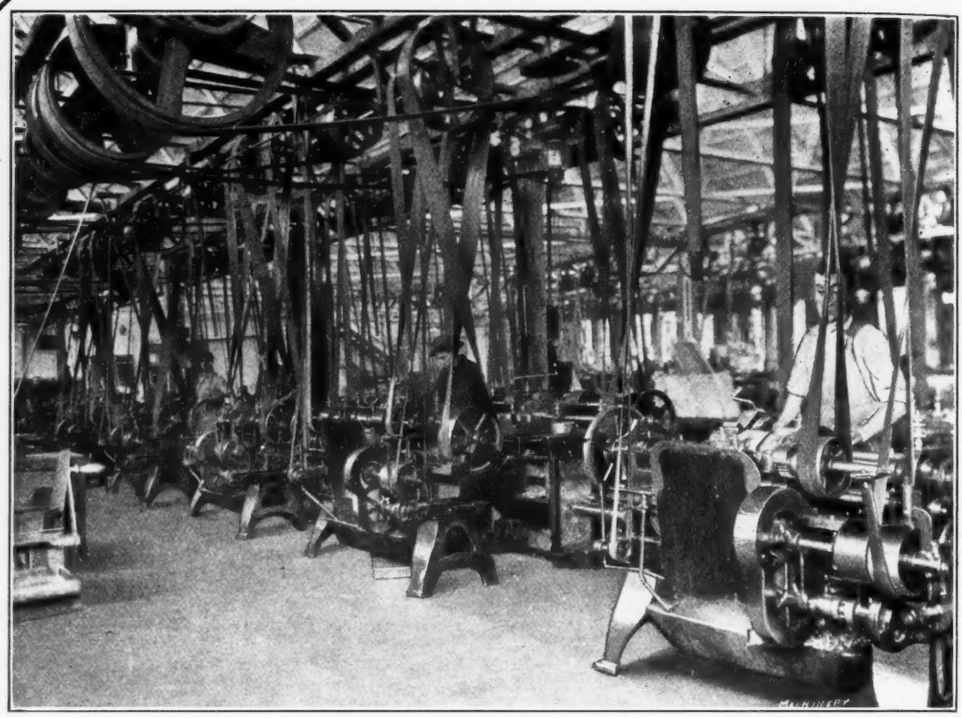
LANDIS MACHINE CO.

WAYNESBORO, PA., U. S. A.

THE WALTER H. FOSTER CO., 50 Church St., New York.

Marshall & Huschart Machinery Co., Sole Agents for Chicago, St. Louis and Indianapolis. Manning, Maxwell & Moore, San Francisco, Cal. The Hendrie & Bolthoff Mfg. and Supply Co., Denver, Colo. R. D. Whitacre & Co., St. Paul, Minn. A. R. Williams Machinery Co., Toronto, Canada. Williams & Wilson, Montreal, Canada. Schuchardt & Schutte, Exclusive Representatives at London and Tokio. D. Drury & Co., Johannesburg, South Africa. Benson Bros., Sydney, Australia.

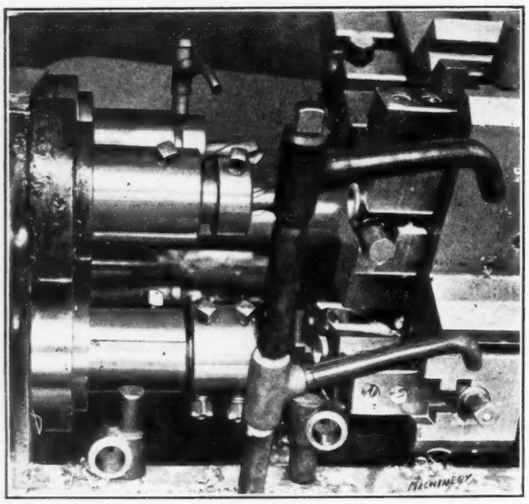
NEW BRITAIN AUTOMATICS



Photograph through the courtesy of the Stewart-Warner Company

60 Swivel Joints per Hour

There are fourteen "New Britain" Automatic Chucking Machines in the Stewart-Warner (Chicago) plant, twelve of which are used exclusively for making speedometer swivel joints —drilling, counterboring and facing the bearings on each arm of the joint—six machines being used for each operation.



This close view of the machine shows the work and the operation. One 49/64" hole is drilled 7/8" deep; one 5/16" hole is drilled 1/2" deep; outside diameter is counterbored to 1" by 1/8" deep and the end is faced at the same time, then the large hole is counterbored to 13/16" its full 7/8" depth. Material is 20 points carbon, drop forged.

Sixty of these swivel joints are turned out per hour by each machine—3600 per day from this one installation of "New Britain" Automatic Chucking Machines. One man runs two machines—making labor cost as low as production is high.

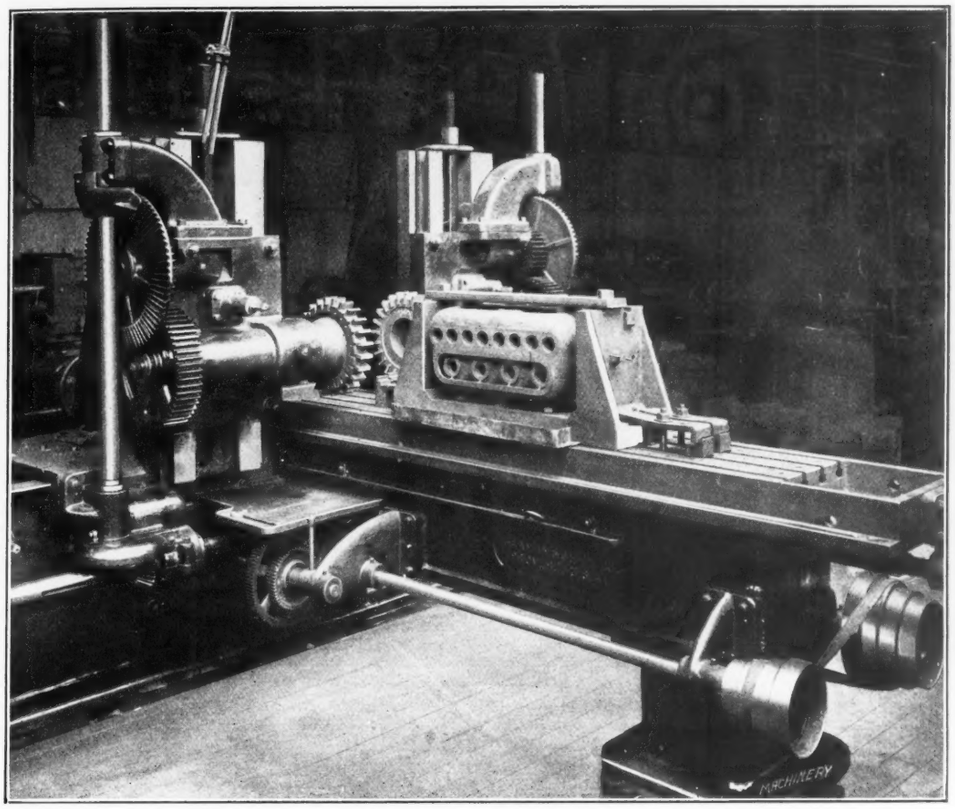
Let us show you other examples of "New Britain" efficiency—work possibly approximating your own more closely.

We manufacture "New Britain" Automatic Screw Machines also. See page 43 of this issue.

THE NEW BRITAIN MACHINE COMPANY

64 Bigelow Street **NEW BRITAIN, CONN., U. S. A.**

AGENTS: Alfred H. Schutte, Paris, Cologne, Brussels, Milan, Bilbao, Berlin and St. Petersburg. Schuchardt & Schutte, London.



A Two-Sided Problem

Automobile engine cylinder castings are usually machined both top and bottom—an excellent example of machining in parallel planes—work which is handled very efficiently by Beaman & Smith Duplex Milling Machines.

The particular machine shown is one used by the White Company, Cleveland. The surface milled is 8½ inches wide by 21 inches long, and ¼ inch is removed from each face by the roughing cut. The cutters are 9-inch diameter, high-speed steel inserted tooth type, and the time for the complete roughing cut on each casting is **12 minutes**, including clamping and removing the work from the rigid jig which is bolted securely to the platen of the machine.

Beaman & Smith "Specials," Boring Machines and Milling Machines, are highly developed, efficient, economical manufacturing tools. If you have the work, we can furnish the machine to handle it best. Write us.

THE BEAMAN & SMITH COMPANY

PROVIDENCE, RHODE ISLAND

AGENTS: Fenwick Freres & Co., Paris.

JUST OUT

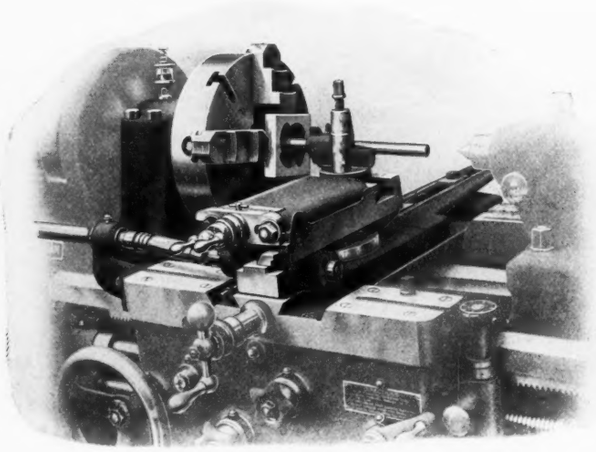


Illustration No. 3 Showing Internal Relief

This lathe has just been put on the market, consequently is the **very latest** in tool room lathes.

The new Relieving Attachment designed for application to this machine is the **only mechanism** of its kind that will perform **all classes** of relieving **without changes** in or **additions** to the regular equipment.

This attachment can be applied to any type of "American" High Duty Lathe, either belt or motor driven, regardless of style of head.

The construction of this mechanism is such as to permit the tool slide to operate at every 30 degrees, thus providing 12 operating positions within a circle.

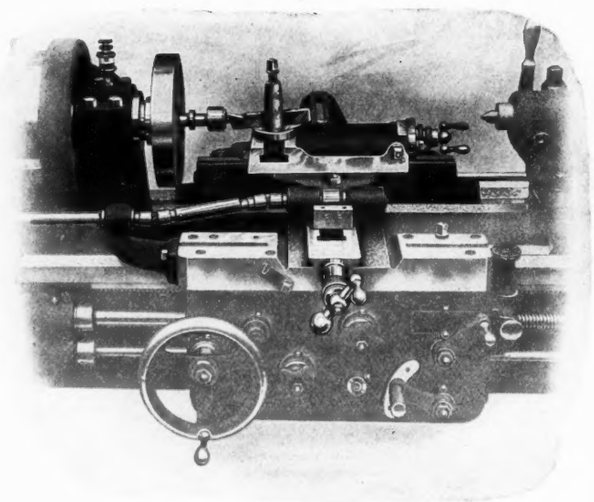
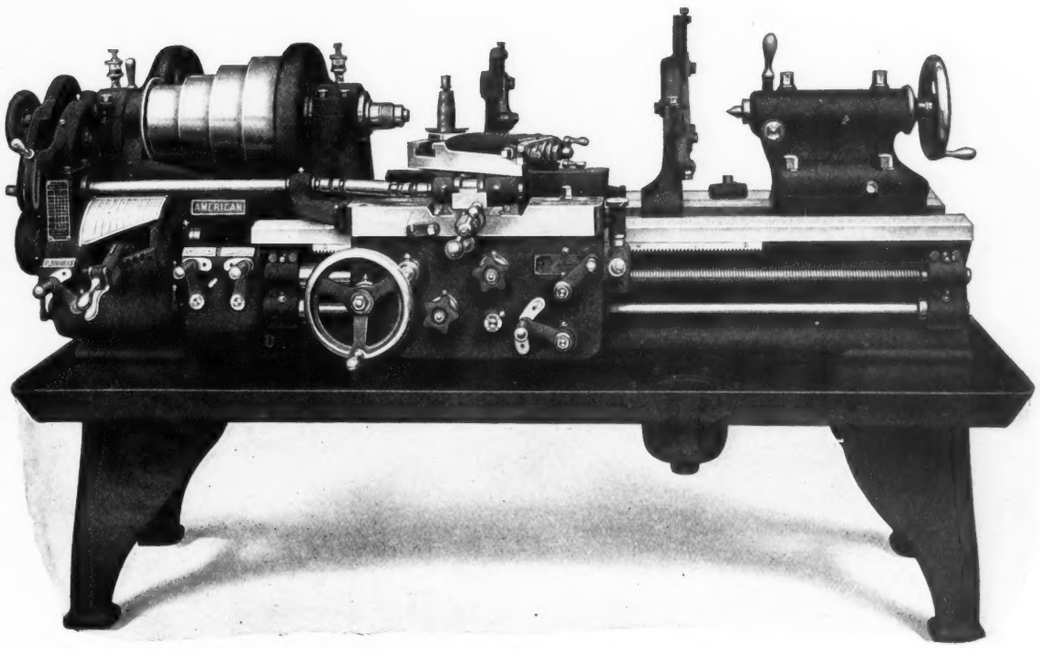


Illustration No. 4 Showing End Relief

LATHES
PLANERS

THE AMERICAN TOOL WORKS

A TOOL ROOM LATHE WITH BRAND NEW FEATURES



"American" High Duty Tool Room Lathe

Another valuable feature will be found in the location of the Universal Joints. These are interposed between the point of drive and the cam, consequently any wear that may take place in the joints will not be imparted to the work.

Simplicity of design is also an important feature of this attachment, as numerous shafts, mitre gears, racks, etc., are eliminated.

There are many other absolutely new features about this Relieving Attachment that will interest you.

Write for our new 8-page illustrated circular that thoroughly illustrates and describes this lathe and all its attachments.

COMPANY, Cincinnati, U. S. A.

SHAPERS
RADIALS

Tool Outfits for the

FOR BAR WORK

Twenty-five years' experience has gone into the design of the set of bar tools shown herewith. The outfit follows the principle adopted for the first Flat Turret Lathe; but it also represents improvements in the original tool scheme resulting from years of experience with thousands of machines since that time.

The outfit consists of 15 sets of chuck jaws, two roller back rest turners, one solid back rest turner, one cross slide for holding cutting-off and forming tools, one pointing tool, one centering tool, and one drill chuck; also one automatic opening die with 15 sets of chasers for threaded work. Besides these there are the necessary wrenches, screwdrivers, gauges, accessories, etc., required for the operation of the machine.

Note in particular the roller turner. The cutting tool may be permanently set for two different diameters. Once adjusted, the change from one to the other is made instantly. The same is true of the roller back rests. The use of rolls for back rests permits turning the work at the highest possible speed the tool will stand, without marring or abrading the work—a thing which is impossible with solid back rests. Every other detail of the tool outfit has been as carefully designed and built.

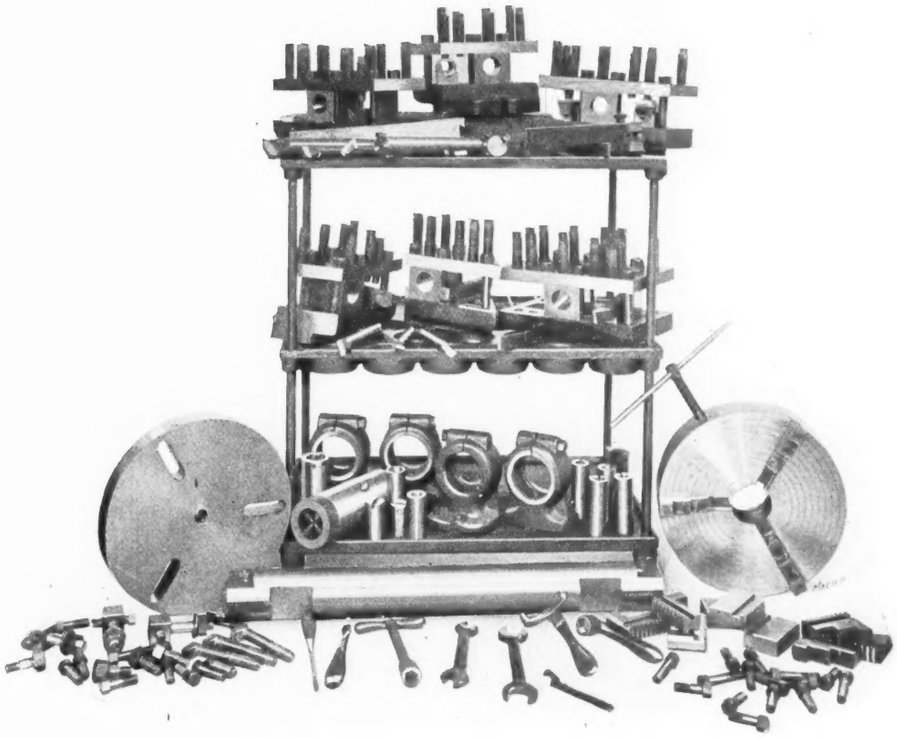
The percentage of the work within the range of the Flat Turret Lathe that this bar outfit will not finish complete, is so small as to be negligible.

Springfield, Vermont, U. S. A.

JONES & LAMSON

Germany, Holland, Belgium, Switzerland, Austria-Hungary, M. Koyemann, Charlottenstrasse 112, Dusseldorf, Germany.

Flat Turret Lathe



FOR CHUCK WORK

Chuck work is harder than bar work to standardize, and to provide with a universal tool outfit. The illustration, however, shows an outfit that has gone to the limit in this direction. It comprises a 12″ face plate with hook bolts and clamp blocks, 12″ 3-jaw scroll chuck with two sets of 3-step jaws, one for inside and the other for outside gripping, one set of long neck jaws for inside gripping, and one set of soft blank jaws that may be turned to fit any special form. There are, besides, six adjustable combination tool blocks with clamp bolts, 8 outside turning cutters, 7 inside turning and boring cutters, two 1½″ round boring bars with 4 cutters, one 3 7-16″ round boring bar with cutter at each end, two square cutter bars with two cutters, an extension drill support with four sockets for standard taper shanks, besides necessary wrenches and other accessories.

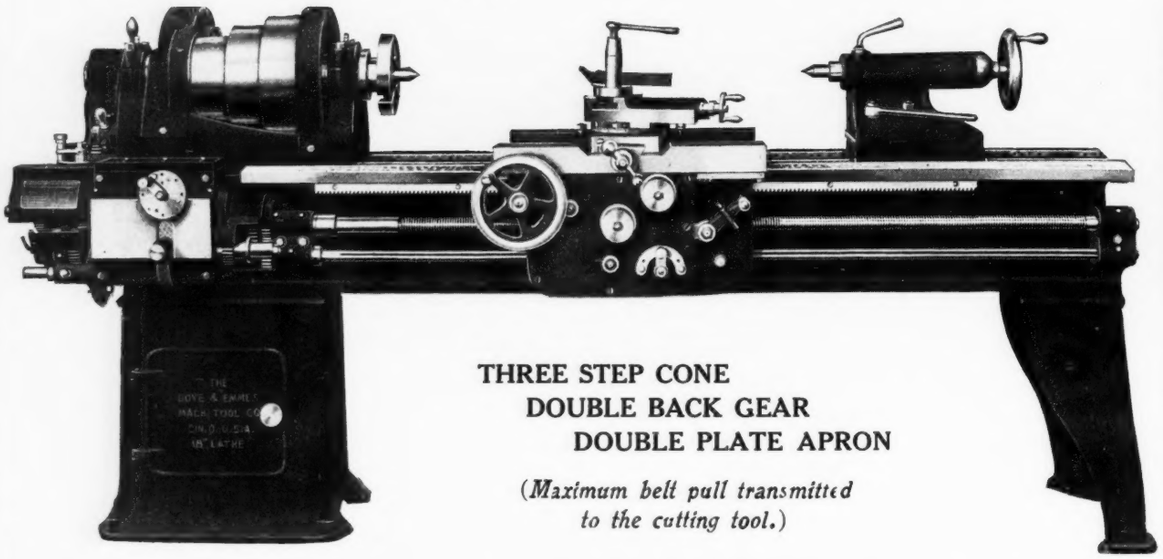
The percentage of chucking work within the range of the Flat Turret Lathe that cannot be done complete with this outfit is very small. While it is sometimes advisable in large production work to provide special tool holders for the machine, yet the purchaser has the satisfaction of knowing that the outfit shown will get him there quickly, easily and accurately on practically anything he may be called upon to turn out, whether in large quantities or small.

The success of the Flat Turret Lathe has been largely built on the usefulness of its tool outfits.

MACHINE COMPANY Queen Victoria Street, London, E. C.

France and Spain, Ph. Bonvillain and E. Ronceray, 9 and 11 Rue des Envierges, Paris. Italy, W. Vogel, Milan.

18-Inch Instantaneous Change Gear Engine Lathe



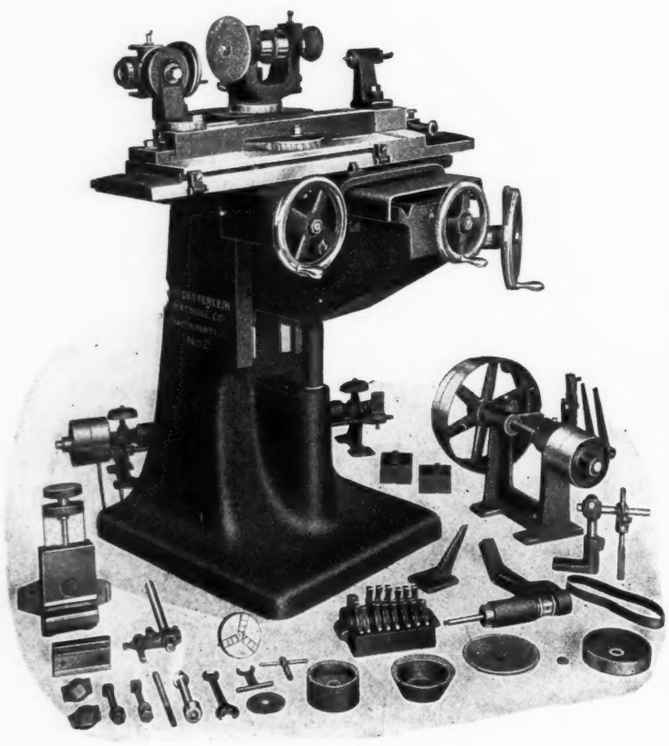
THREE STEP CONE
DOUBLE BACK GEAR
DOUBLE PLATE APRON

(Maximum belt pull transmitted to the cutting tool.)

THE BOYE & EMMES MACHINE TOOL CO.

Successors to SCHUMACHER & BOYE

ENGINE LATHES **CINCINNATI, OHIO, U. S. A.**



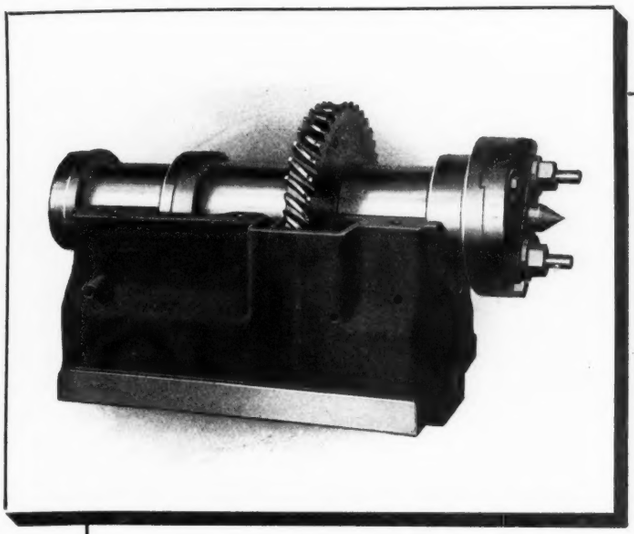
Oesterlein Cutter and Tool Grinder

For grinding milling cutters, gear cutters, reamers, gauges, shafts, bushings, etc., an Oesterlein No. 2 Universal Cutter and Tool Grinder is unsurpassed.

Adaptable to a wide range of grinding work, it is practically a shop necessity. The rigid table support insures accuracy; swiveling table allows feed and stops to be used at ninety degrees to the wheel; periphery of cutters can be ground with cup wheels, giving straight line of clearance to cutting edges of teeth; hardened steel spindle; bronze bearing boxes, adjustable, dust and emery proof, and many other valuable features.

We also make Universal and Plain Milling Machines. Booklet on request.

OESTERLEIN MACHINE COMPANY
CINCINNATI, OHIO, U. S. A.



Why has the Fay Lathe a Worm Drive?

Few machine tools are built with a worm drive for the spindle. The Fay Lathe is one of the few. What is the reason?

The Fay Lathe is an intensive machine. The question is not "How many machines can a man run" but "How few machines will keep a man busy." In nine cases out of ten two machines will keep a man jumping changing the work. The machines must be arranged, therefore, so that the operator will have the fewest steps to take and the fewest motions to make when running two machines only.

If a man is to run two machines and to keep steadily at it he should stand between them. The Fay Lathe operator, provided with an arbor press, a box of rough work and a box of finished work, and a machine on each side, makes every move count. He hardly has to stir from his tracks. His efficiency is away beyond that of the man who roams from one end to the other of a long row of machines. A pair of Fay Lathes, therefore, should be set facing each other with the operator between them.

Now the natural drive for a pair of lathes facing each other requires they should be set at right angles to the line shaft. A well-made worm and wheel form the most satisfactory right-angle drive. Therefore, the Fay Lathe is worm driven.

With the large bearing area of the hardened steel worms and phosphor bronze wheels, and with constant running in an oil-tight case of lubricant, the worm drive is satisfactory from every standpoint whether it be efficiency, durability or steadiness and quietness.

JONES & LAMSON MACHINE CO.

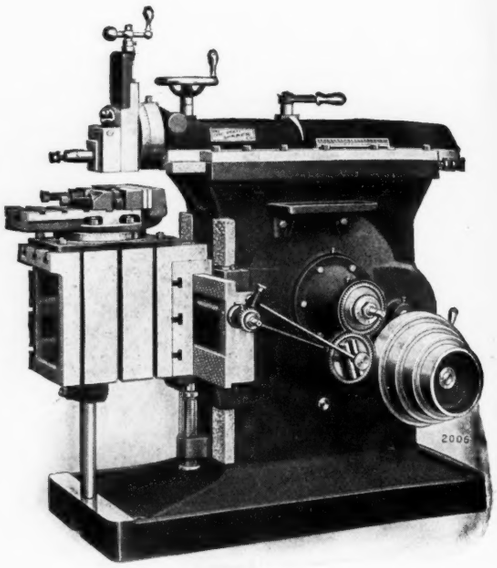
SPRINGFIELD, VERMONT, U. S. A.

Germany, Holland, Switzerland, Austria-Hungary, M. Koyemann, Charlottenstrasse 112, Dusseldorf, Germany. France and Spain, Ph. Bonvillain and E. Ronceray, 9 and 11 Rue des Envierges, Paris. Italy, W. Vogel, Milan.

The form of the Crank Wheel in

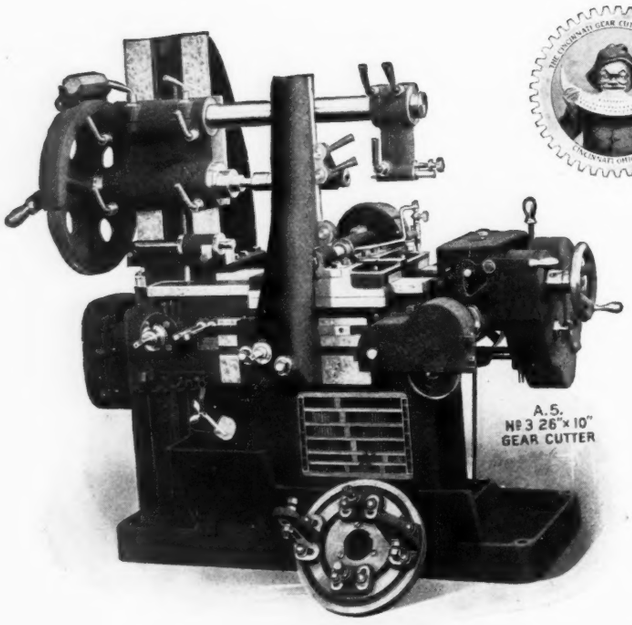
"CINCINNATI" HEAVY DUTY SHAPERS

that is, its two diameter bearing and its drop-forged crank block set well into the face of the gear, makes it proof against breakage, and we so guarantee it.



THE CINCINNATI SHAPER COMPANY, Cincinnati, Ohio

AGENTS: Manning, Maxwell & Moore, Inc., New York, Philadelphia, Chicago ,Boston, St. Louis, Detroit, Cleveland, Buffalo, Milwaukee and Mexico City. Brown & Zortman Machinery Co., Pittsburgh. The National Supply Co., Toledo, Ohio. Eccles & Smith Co., San Francisco, Cal. Hallidie Machinery Co., Seattle, Wash. Zimmerman-Wells-Brown Co., Portland, Oregon. C. T. Patterson Co., Ltd., New Orleans, La. Chas. Churchill & Co., Ltd., London, Birmingham, Manchester, Newcastle-on-Tyne, Glasgow. A. H. Schutte, Cologne-Deutz, Berlin, Brussels, Paris, Milan, Barcelona, Bilbao, St. Petersburg. Donauwerk Ernst Krause & Co., Vienna, Prague and Budapest. Thos. McPherson & Son, Melbourne. Andrews & George, Yokohama.



Place a

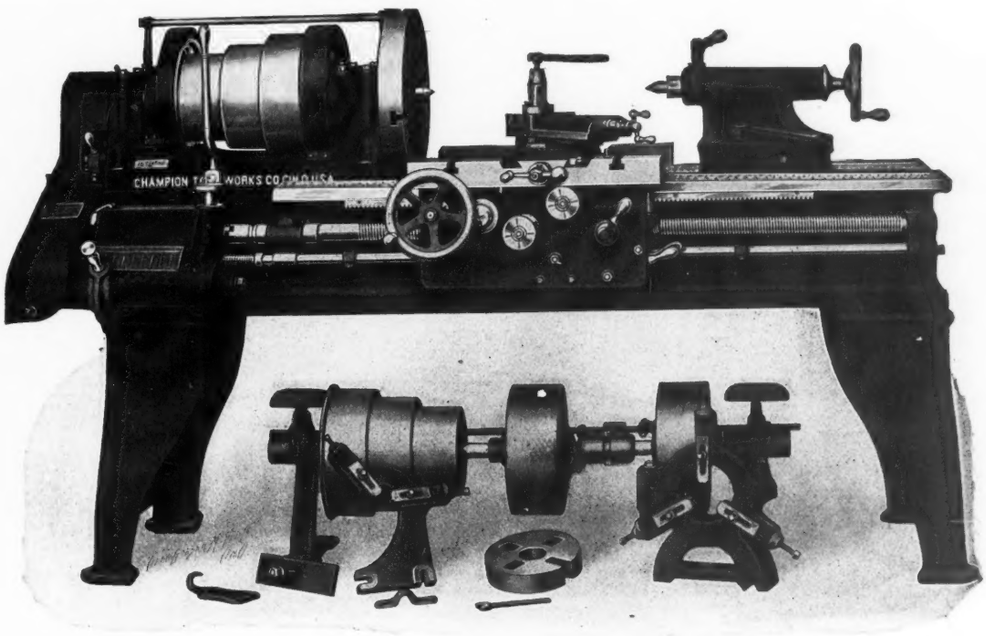
"CINCINNATI"

by any other make of Gear Cutter in your shop, and we will demonstrate that for production, accuracy and convenience, it is unexcelled.

THE CINCINNATI GEAR CUTTING MACHINE COMPANY

ELAM STREET AND GARRARD AVENUE, CINCINNATI, OHIO

AGENTS: Manning, Maxwell & Moore, Inc., New York, Boston, Chicago, Philadelphia, St. Louis, Cleveland, Syracuse, Buffalo, Mexico City, Milwaukee and Detroit. Brown & Zortman Machinery Co., Pittsburgh. Chas. Churchill & Co., Ltd., London, Birmingham, Manchester, Newcastle-on-Tyne and Glasgow. Donauwerk Ernst Krause & Co., Prague and Budapest. A. H. Schutte, Cologne, Berlin, Paris, Brussels, Milan, Bilbao; Barcelona and St. Petersburg. Andrews & George, Yokohama.



Complete Control from One Position

Champion Lathes are time savers. The Champion operator does not leave the front of his machine—he shifts the lever on the front of the headstock and changes the feed by a positive internal key clutch.

Champion Lathes are back geared and have a quick change gear box giving forty different changes of feeds and threads without the removal of a gear, eight of which are controlled by one lever.

The "proof of the pudding is in the eating"—you can best judge a Champion by actual working test. As it is, unfortunately, impossible for us to meet all readers personally and show them Champion Lathes under operation, we would appreciate, and you will benefit from, an acquaintance through the mail. We've embodied a lot of fine points in Champion design. Write for details.

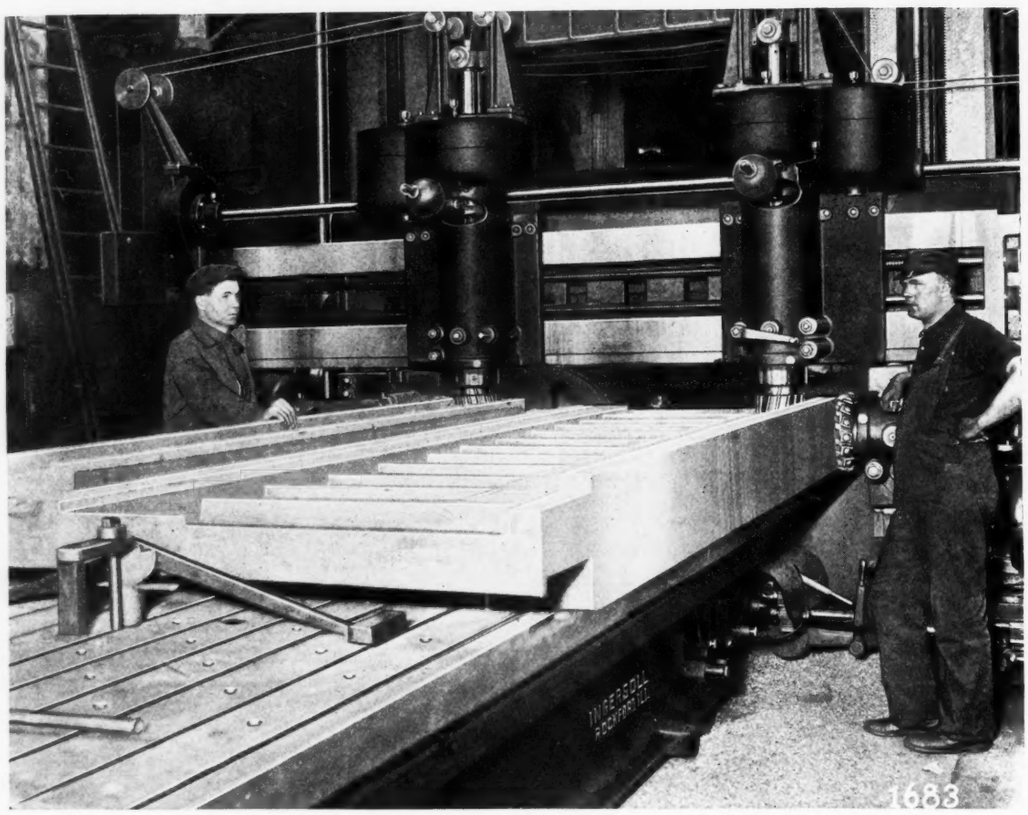
We manufacture 10, 12, 14, 16 and 18 inch swing models.

Champion Tool Works Company

2422 Spring Grove Avenue CINCINNATI, OHIO, U. S. A.

FOREIGN AGENTS: Pfeil & Co., London. W. Steinhaus & Co., Paris and Brussels. Neilsen & Winthers, Copenhagen. C. S. Christensen, A-S, Christiania. De Fries & Co., Milan. Alfred Herbert, Ltd., Yokohama.

INGERSOLL MILLING MACHINES
ON HEAVY MILLING



Wide or narrow surfaces, on heavy or light work, may be finished by milling much more efficiently than by any other means. Some of the most noteworthy installations of Ingersoll Milling Machines have been for heavy milling.

The illustration shows an 80″ x 30″ Four Head Adjustable Rail Ingersoll Milling Machine finishing a heavy cast-iron table, 72″ wide, 12″ thick and 120″ long. The side heads on this machine are taking cuts from the rough casting 12″ wide, 7-16″ deep at 5⅜″ feed per minute, and this is not a phenomenal or exhibitional milling job. Equal or perhaps better results than this can be obtained on your work.

Since 1886 Ingersoll Millers have solved problems of efficient manufacturing in plants of hundreds of successful manufacturers in many different lines of work. Even though your present costs are not apparently excessive, the ever present joy, *competition*, demands minimum manufacturing costs. From the experience of others we feel sure you will find that minimum cost can be obtained by milling.

Without entailing any expense or obligation on yourself, you can find out the milling cost. Ask us. Our product exclusively.

INGERSOLL MILLING MACHINES **INGERSOLL MILLING CUTTERS**
INGERSOLL CUTTER GRINDERS

THE INGERSOLL MILLING MACHINE COMPANY

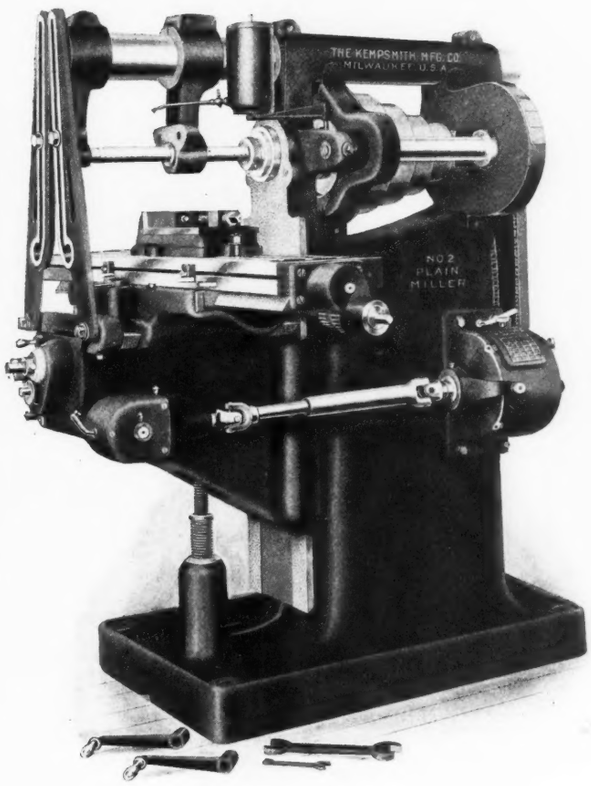
Main Office and Works: ROCKFORD, ILL., U. S. A.

New York Office, 50 Church St., The Walter H. Foster Co. **Detroit Office, 827 Ford Bldg., H. C. Rose & Co.**
Cleveland, W. M. Grove

FOREIGN AGENTS: C. W. Burton, Griffiths & Co., London, England. F. G. Kretschmer & Co., Frankfurt, a/M., Germany. R. S. Stokvis & Zonen, Rotterdam, Holland. Fenwick Freres & Co., Paris, France. Schuchardt & Schutte, Yokohama, Japan.

KEMPSMITH

NO. 2 PLAIN MILLER



FOR MANUFACTURING

Rigid in every detail of its construction, and capable of continued severe service.

Convenient to operate. Note absence of complicated levers. All feeds engaged, released and reversed from extreme front of knee.

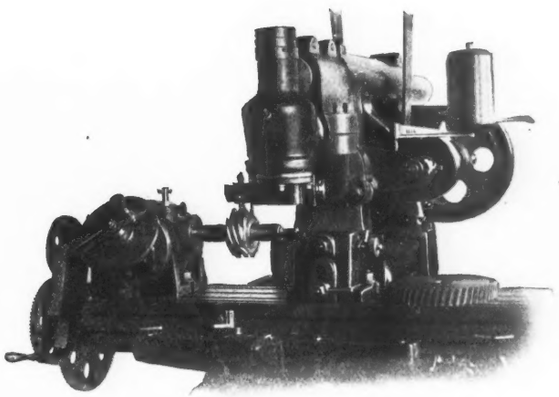
Competent to pull heavy cuts, because of large diameter and wide face of cone. Liberal dimensions of spindle and ample bearings.

FOR SPECIAL WORK

Accurate to the highest degree, and guaranteed within very close limits.

Simple in design and will maintain its accuracy.

Adaptable to a wide range of work. Can be fitted with spiral cutting dividing head and universal attachment.



The Kempsmith Manufacturing Co.

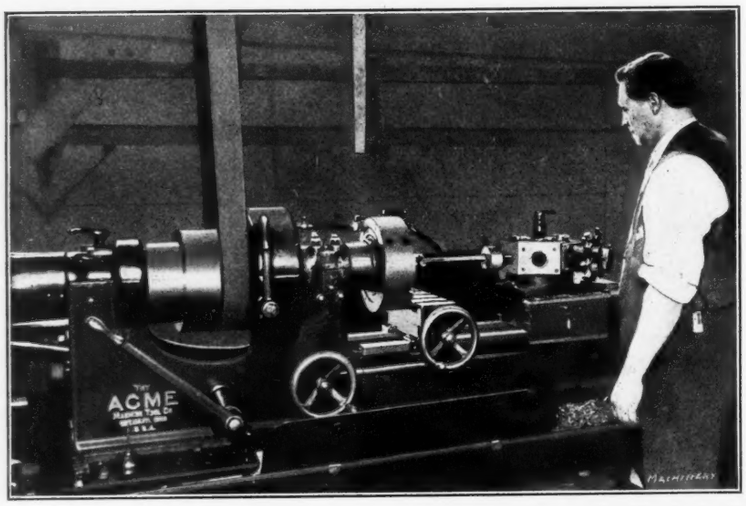
Milwaukee, Wis.

DOMESTIC AGENTS: Carolina Supply Co., Greenville, S. C. English Tool & Supply Co., Kansas City, Mo. E. L. Essley Machinery Co., Chicago, Ill. Fairbanks Co., Boston, Mass., Baltimore, Md. C. E. Fales Machinery Co., Detroit, Mich. Laughlin-Barney Machinery Co., Pittsburgh, Pa. National Supply Co., Toledo, Ohio. Northern Machinery Co., Minneapolis, Minn. Osborne & Sexton Machinery Co., Columbus, Ohio. Rix Compressed Air & Drill Co., San Francisco, Cal. Salt Lake Hardware Co., Salt Lake City, Utah. Smith-Booth-Usher Co., Los Angeles, Cal. Smith-Courtney Co., Richmond, Va. Syracuse Supply Co., Syracuse, N. Y., and Buffalo, N. Y. Swind Machinery Co., Philadelphia, Pa. Thomas Lowe Machinery Co., Providence, R. I. Vandyck Churchill Co., New York City, N. Y. Vonnegut Machinery Co., Indianapolis, Ind.

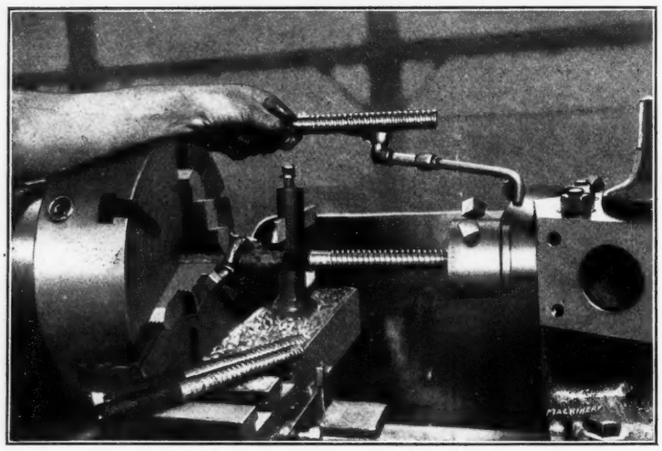
FOREIGN AGENTS: Selson Eng'g Co., London, England. Thielicke & Co., Berlin, Germany. Edgar Bloxham, Paris, France. O. R. San Galli, St. Petersburg, Russia. Hans Schulze, Vienna, Austria. Kann & Heller, Budapest, Hungary. A. Engelmann & Co., Liege, Belgium. Stussi & Zweifel, Milan, Italy. Schaufelberger & Co., Zurich, Switzerland. Post Van der Burg & Co., Rotterdam, Holland. G. Hartmann, Christiania, Norway. Aktiebolaget Goteborgs Maskinaffar, Gothenburg, Sweden. Bevan & Edwards Pty., Ltd., Melbourne, Australia. Parke & Lacy Co., Ltd., Sydney, N. S. W., Australia. Leslie A. Walker, Wellington, N. Z.

Ever Cut Square Threads with a Die?

HOW do you cut square threads? Most machinists use a single cutting tool on the lathe. The Warner Elevator Co., Cincinnati, Ohio, find, however, that by using a *20″ Acme Turret Machine* with Stock Feed they can cut square threads on 1″ stock—*with dies*. Their method requires considerably less time to complete the *entire* screw than was necessary by the old single-tool method to cut the thread alone. They now turn out 12 brake rod screws threaded along 6″ of their length in an hour.



Here's how they do it: The 1″ stock is fed out to the stop and turned down to 15-16″ with a box tool held in the turret, two dies, set in holes in the turret, then rough and finish the thread, giving a 1-4″ pitch. A cut-off tool on the cross slide cuts the rod to length. This is just one instance of an Acme "Short Cut."



Acme Flat Turret Lathes

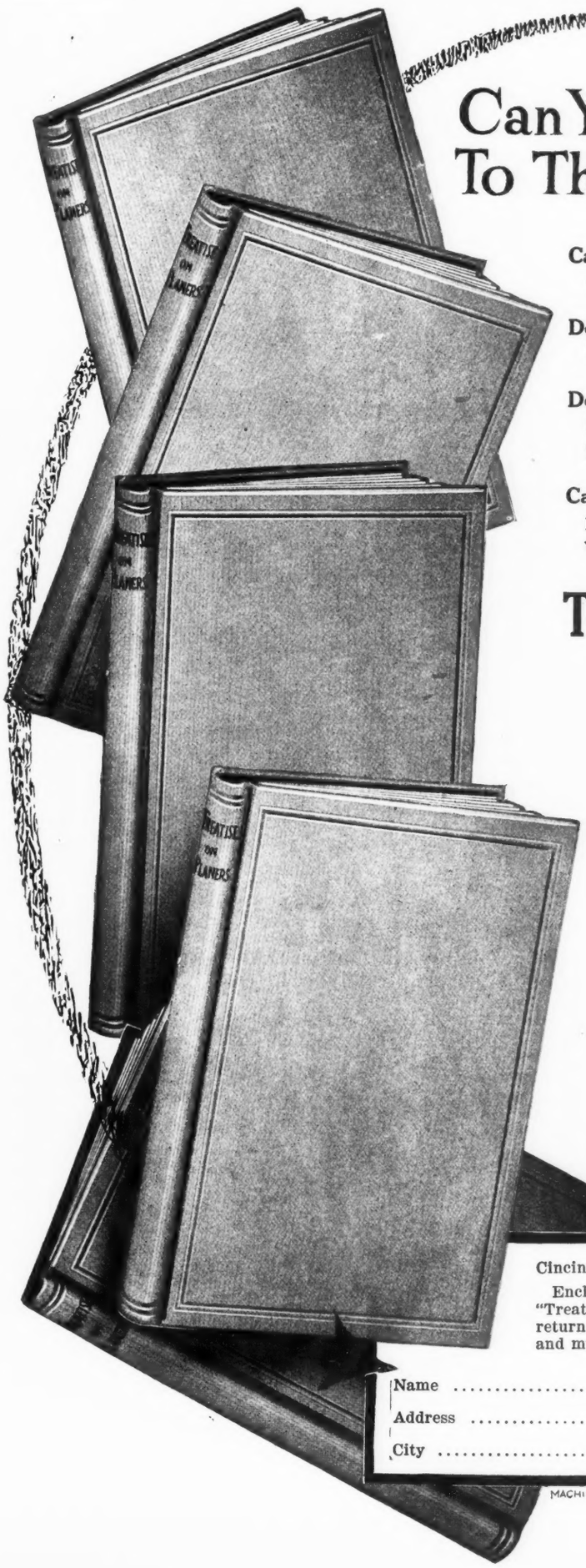
are built to assure the best work. The head cast solid with the bed, and the massive saddle give the stiffness required for accuracy. The stock feed, cut-off rest and independent adjustable stops for each hole of the turret are features that add to speed and convenience in operation. Time spent studying how these machines can increase the output of your shop will be profitably invested.

Want a catalogue?

The Acme Machine Tool Co., Cincinnati, Ohio, U. S. A.

DOMESTIC AGENTS: The Prentiss Tool & Supply Co., New York, Boston, Syracuse and Scranton, Pa. Marshall & Huschart Machinery Co., Chicago, Milwaukee, Indianapolis and St. Louis. W. E. Shipley Machinery Co., Philadelphia. Motch & Merryweather Co., Cleveland, Cincinnati, Columbus, O., Detroit and Pittsburgh. Syracuse Supply Co., Buffalo and Rochester. Harron, Rickard & McCone, San Francisco and Los Angeles. Hallidie Machinery Co., Seattle and Spokane. Zimmerman-Wells-Brown Co., Portland, Ore. Gallagher Machinery Co., Salt Lake City. Dewstoe Machine Tool Co., Birmingham and Atlanta. Kemp Machinery Co., Baltimore and Richmond, Va. Northern Machinery Co., Minneapolis. C. T. Patterson Co., Ltd., New Orleans. Hendrie & Bolthoff, Denver.

FOREIGN AGENTS: H. W. Petrie, Ltd., Toronto. Rudel Belknap Mchy. Co., Montreal. George H. Alexander, Birmingham, England. J. Lambercier & Co., Geneva, Switzerland. E. Isbecque & Cie., Antwerp, Belgium. Thielicke & Co., Berlin, Germany. G. Hartman, Christiania, Norway. Krajewski-Pesant Co., Havana, Cuba. Allied Mchy. Co. of America, Vienna, Austria. Andrews & George, Yokohama, Japan. M. Buarque & Co., Rio de Janeiro, Brazil.



Can You Answer Yes To These Questions?

Can you set up and plane locomotive cylinders of various types?

Do you know about using the floor head on large work?

Do you know that all really accurate flat surfaces are made with single pointed tools? And why?

Can you say what work is best to plane or mill or grind—why and when?

This Treatise on Planers

answers these and many other perplexing shop questions. It is an up-to-date textbook on modern planing—a book for superintendents, managers, foremen and operators. It contains facts which have taken years to gather and verify—facts, mind you, not theories.

It defines the profitable field of planing and its relations to the fields of milling and grinding. It tells and illustrates how to get the right results.

One hundred pages, cloth bound, fifty cents a copy. Money back if you want it. Mail the coupon today.

Cincinnati Planer Co.

Cincinnati, Ohio

Cincinnati Planer Co., Cincinnati, O.

Enclosed find fifty cents. Send me a copy of the "Treatise on Planing." It is understood that I may return the book, if it does not meet my expectations, and my money will be returned.

Name .....

Address .....

City .....State.....

MACHINERY

MACHINERY

Reasons, Yes the Very Best of Reasons, Why

THE CINCINNATI

Upright Drilling Machines

Are the Only Tools of Their Kind Fit for Your Drilling Problems

CINCINNATI Upright Drilling Machines have been on the market about fifteen years and from the very beginning, due to the fact that quality, capacity and efficiency were the prime factors in construction, they have occupied the position of the leading upright drilling machines in the world.

Possibly no other line of machinery has ever been put on the market which has been so universally acknowledged in its superiority, so generally copied by the competition and so often referred to as the standard of excellence, as has been the case in the CINCINNATI Upright Drilling Machines.

Some of the competition have copied one feature, others have taken other points; but none have been large enough to copy all the many points of advantage, hence no other upright drilling machine equals the CINCINNATI today.

The CINCINNATI Upright Drilling Machine has forced every manufacturer in this line to build better drilling machines. Incorporated in CINCINNATI Drilling Machines today are the following:

Columns, spindles, sleeves and shafts accurately ground.

Bevel gearing planed theoretically correct.

Patent positive geared feed, indexed, located on head.

Patent positive tapping attachment located on spindle.

Friction back gears for instantaneous engagement.

Auxiliary locking device for head.

Enlarged table and table arm bearings.

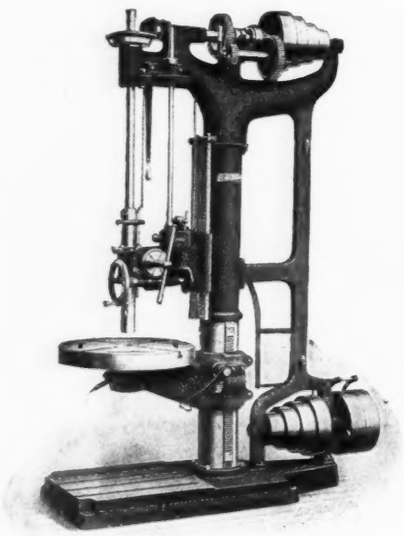
Round, square or compound tables.

Motor drives, geared or belted, also right angle drive.

Any size drill arranged in gangs from two to six spindles.

Two distinct lines of upright drilling machines, one for ordinary twist drill use, the other for strictly high-speed twist drill use.

The catalogue tells and illustrates it all.



THE CINCINNATI

THE CINCINNATI BICKFORD TOOL COMPANY

Oakley, Cincinnati, Ohio, U. S. A.

DOMESTIC AGENTS: Prentiss Tool and Supply Co., New York City, Buffalo, Rochester and Syracuse, N. Y.; Boston, Mass.; Scranton, Pa. Marshall & Huschart Machinery Co., Chicago, Ill.; Indianapolis, Ind.; St. Louis, Mo.; Milwaukee, Wis. Motch & Merryweather Machinery Co., Cleveland and Cincinnati, Ohio; Detroit, Mich. W. E. Shipley Machinery Co., Philadelphia, Pa. Brown & Zortman Machinery Co., Pittsburgh, Pa. Harron, Rickard & McCone, San Francisco and Los Angeles, Cal. Robinson, Cary & Sands Co., St. Paul and Duluth, Minn. Hallidie Machinery Co., Seattle, Wash. The Hallidie Co., Spokane, Wash. C. T. Patterson Co., Ltd., New Orleans, La. Dewstoe Machine Tool Co., Birmingham, Ala. Seeger Machine Tool Co., Atlanta, Ga. Kemp Machinery Co., Baltimore, Md. H. W. Petrie, Ltd., Toronto, Ontario and Montreal, Quebec, Canada. Taylor & Young, Ltd., Vancouver, B. C., Canada. Zimmerman-Wells-Brown Co., Portland, Ore. Gallagher Machinery Co., Salt Lake City, Utah. Erie Mfg. & Supply Co., Erie, Pa. Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo.

Reasons, Yes the Very Best of Reasons, Why

THE CINCINNATI BICKFORD

Radial Drilling Machines

Are the Only Tools of Their Kind Fit for Your Drilling Problems

For twenty-five years the Bickford Radial Drills, as they were first known, have been the recognized standard in the radial drilling machine line.

The advent of high-speed twist drills brought a new era to the radial drill industry, and about that time the Bickford Drill & Tool Co. became part of the present Cincinnati Bickford Tool Co. Strenuous study was at once given the future of radial drilling machinery, resulting in bringing out two new radial drills known as the CINCINNATI BICKFORD, the one for getting greater efficiency out of the ordinary twist drill; the other strictly a high-speed, high-power machine for driving high-speed twist drills to destruction.

What is the history of the CINCINNATI upright drilling machines is the history of the CINCINNATI BICKFORD radials. The machine is the acknowledged standard of the world. A competitor takes one point, another prefers some other feature, but they all, when comparing their machines, say "as compared with the CINCINNATI BICKFORD," acknowledging the wonderful superiority of these machines.

In buying CINCINNATI BICKFORD radial drills today you get the following in which these machines are the pioneers:

Steel gearing, more than in any other radial, correctly incorporated, both as to material and where it is used.

Bronze Bushings. The CINCINNATI BICKFORD Radials were the first to have bronze bushings.

Ball Bearings. These have been incorporated to facilitate the manipulation of the machine at every point where such service is needed.

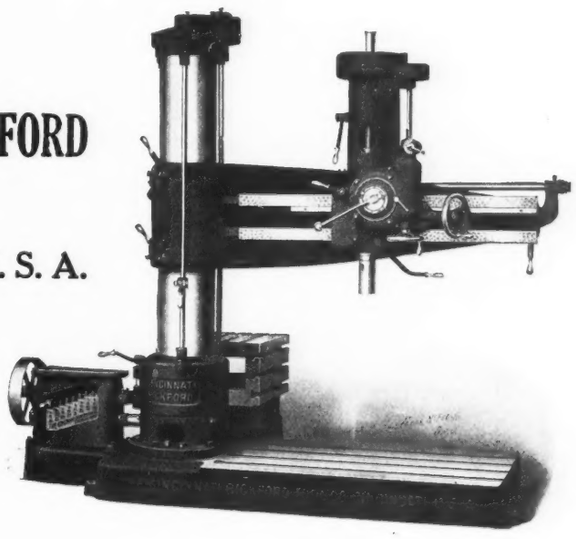
Clamping. The clamping device used on the CINCINNATI BICKFORD Radial is acknowledged the only one which effectually and securely performs its functions.

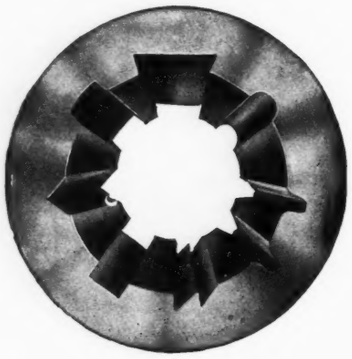
THE CINCINNATI BICKFORD

THE CINCINNATI BICKFORD TOOL COMPANY

Oakley, Cincinnati, Ohio, U. S. A.

FOREIGN AGENTS: Alfred H. Schutte, Cologne and Berlin, Germany; Brussels, Belgium; Paris, France; Milan, Italy; Barcelona and Bilbao, Spain; St. Petersburg, Russia. Donauwerk Ernst Krause & Co., Vienna and Prague, Austria; Budapest, Hungary. Chas. Churchill & Co., Ltd., London, Birmingham, Manchester, Newcastle-on-Tyne, Eng.; Glasgow, Scotland. Krajewski-Pesant Co., Havana, Cuba. Thomas McPherson & Son, Melbourne, Australia. Andrews & George, Yokohama, Japan. Robert Pusterla & Co., Buenos Aires, South America. V. Lowener, Christiania, Norway. Nienstaedt & Co., Copenhagen, Denmark. Sam Lagerlofs, Stockholm, Sweden. Bartle & Co., Johannesburg, South Africa. M. Buarque & Co., Rio de Janeiro, Brazil. David S. Hays, New York City.





The "GIANT"

No. 5—With a 4 7-8" Post

A Keyseater of the Right Design

There are keyseaters on the market which are either made particularly for the work they have to keyseat or the job must be adapted to the machine. The **GIANT** Keyseater will cut a keyway in any piece of work, of any size or shape, and the work can be fastened and released in the time usually required by other machines for "getting ready." In this machine the work is fastened by the bore alone; the hub does not need to be faced and a quantity of parts, spur gears or similar pieces, may be keyseated at the same time; taper keyseats as easily cut as straight keyways.

Accuracy is not a matter of guess on a machine like the **GIANT** for the post which holds the work serves as a guide for the cutting tool. Six different sizes to handle the lightest and the heaviest work. When thinking of keyseating think of the **GIANT.**

Our catalogue describes all sizes. Want one?

MITTS & MERRILL, Saginaw, Mich.

843 WATER STREET

FOREIGN AGENTS: C. W. Burton, Griffiths & Co., London, England. Heinrich Dreyer, Berlin, Germany; Austria and Russia. Leon Chapuis, Paris, France; Belgium and Switzerland. V. Lowener, Stockholm, Sweden; Christiania, Norway.

"MORSE"
HOLLOW DRILLS
FOR DEEP DRILLING OR LONG HOLES

These Drills are very much in demand. They have no equal for the kind of work for which they are made. Our catalogue shows an outline drawing of the manner in which they are used, also a full description of the drills themselves. It also shows various kinds of Oil Drills, Three- and Four-Groove Drills, Shell Drills and a large number of other styles.

DRILLS CUTTERS
CHUCKS REAMERS
TAPS DIES

The first consideration in buying tools is QUALITY; the second consideration is EFFICIENCY; the third consideration is RELIABILITY.

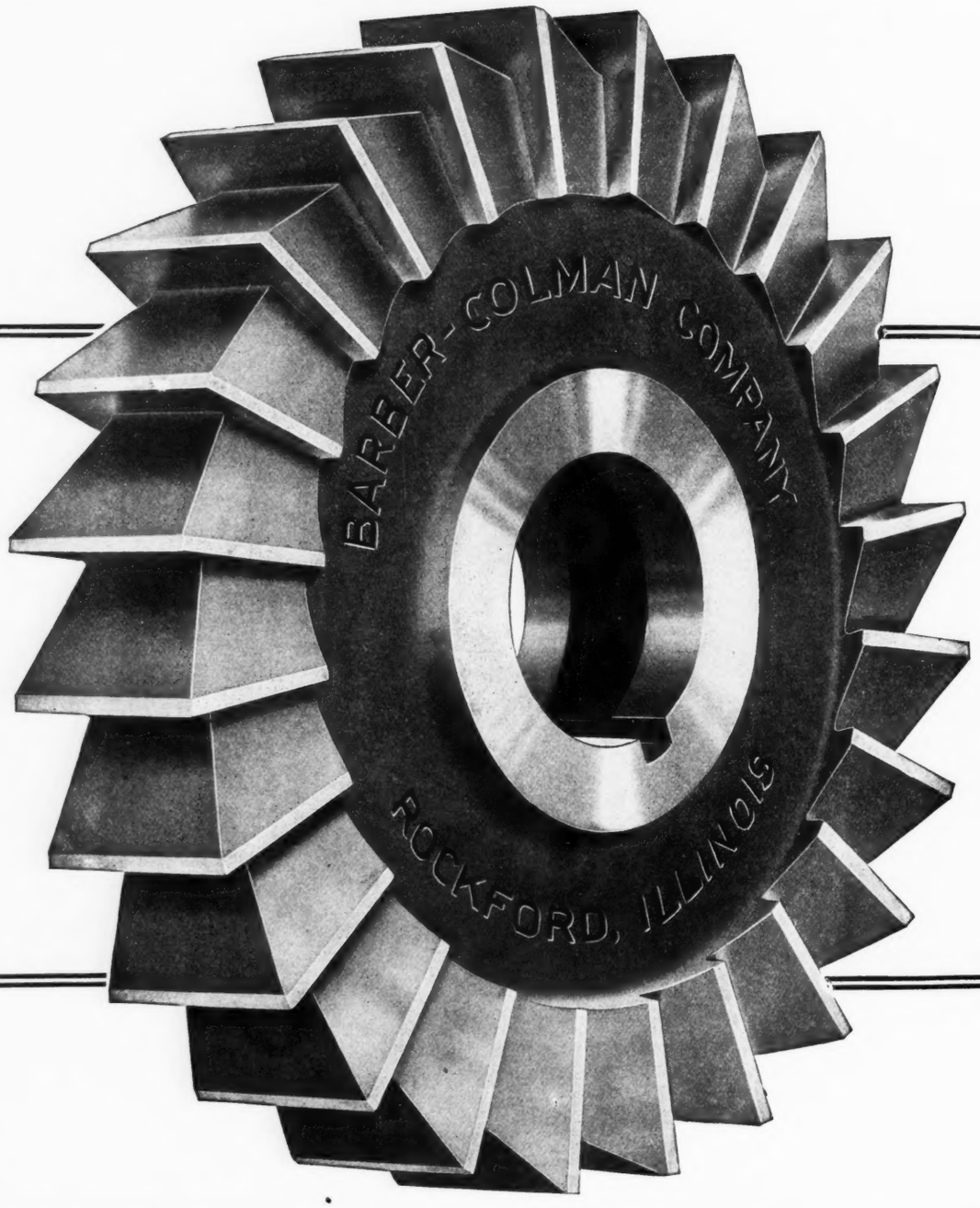
These are values that the buyer MUST NOT OVERLOOK.

Some of the lines mentioned will appeal to you more than others, but there is nothing in the whole list of "MORSE" TOOLS on which you can make a mistake.

Carbon and High Speed Steel Tools.

Send for illustrated catalogue—free.

Morse Twist Drill & Machine Company
New Bedford, Massachusetts, U. S. A.



It is One Thing to Make a Good Cutter Occasionally

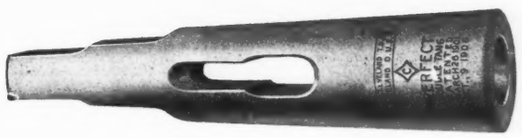
It is an entirely different matter to make quantities of cutters uniformly good. And unless you buy cutters which are uniformly good, exact duplicates, accurate as to size and of the same hardness and cutting capacity, you are not getting the full return on the money invested.

Barber-Colman Cutters are uniformly good cutters—designed by experts, made right, tested thoroughly. They are guaranteed absolutely —material, workmanship and accuracy.

BARBER-COLMAN COMPANY, Rockford, Ill., U. S. A.

"PERFECT Double-Tang" SOCKETS

Patented March 26, 1901.



Patented October 9, 1906.

Fit any spindle having a regular taper hole.

End your Tang Troubles.

The broken tang was only .312 inches in thickness.

Reclaim Your Scrap-Heap.

The new tang is .500 inches in thickness.

TRADE MARK

The same drill but—

THIS illustration shows the tang twisted off, the condition of many discarded drills in your scrap heap that are otherwise good.

With the old style socket it is practically impossible to turn down the shank for a new tang and center the drill so it will run true. When it is attempted not one in ten is satisfactory.

With the "Perfect Double-Tang" Socket every one can be simply and easily reclaimed, as shown in the right hand column.

The same drill but—

THIS illustration shows a new tang ground or milled on the old shank to fit the "Perfect Double-Tang" Socket. It is a stronger tang than the old one, being from 25 to 60 per cent thicker, according to the size of the shank. It will last through the life of the drill.

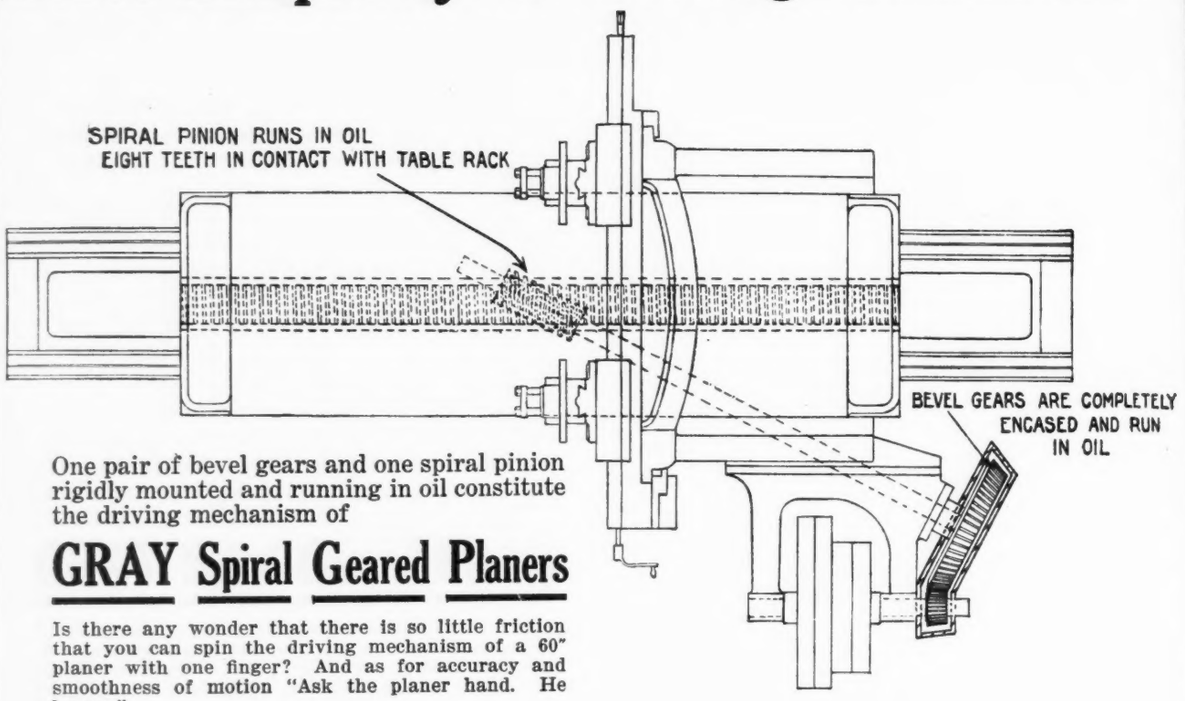
When you have reclaimed your scrap heap in this way and begin to use double-tang drills in "Perfect Double-Tang" Sockets, you will end your tang troubles for all time.

Pamphlet No. 18-M gives details and prices.

The CLEVELAND Twist Drill Co.

New York CLEVELAND, OHIO Chicago

Note Simplicity of Driving Mechanism



One pair of bevel gears and one spiral pinion rigidly mounted and running in oil constitute the driving mechanism of

GRAY Spiral Geared Planers

Is there any wonder that there is so little friction that you can spin the driving mechanism of a 60" planer with one finger? And as for accuracy and smoothness of motion "Ask the planer hand. He knows."

THE G. A. GRAY COMPANY, Cincinnati, Ohio, U. S. A.

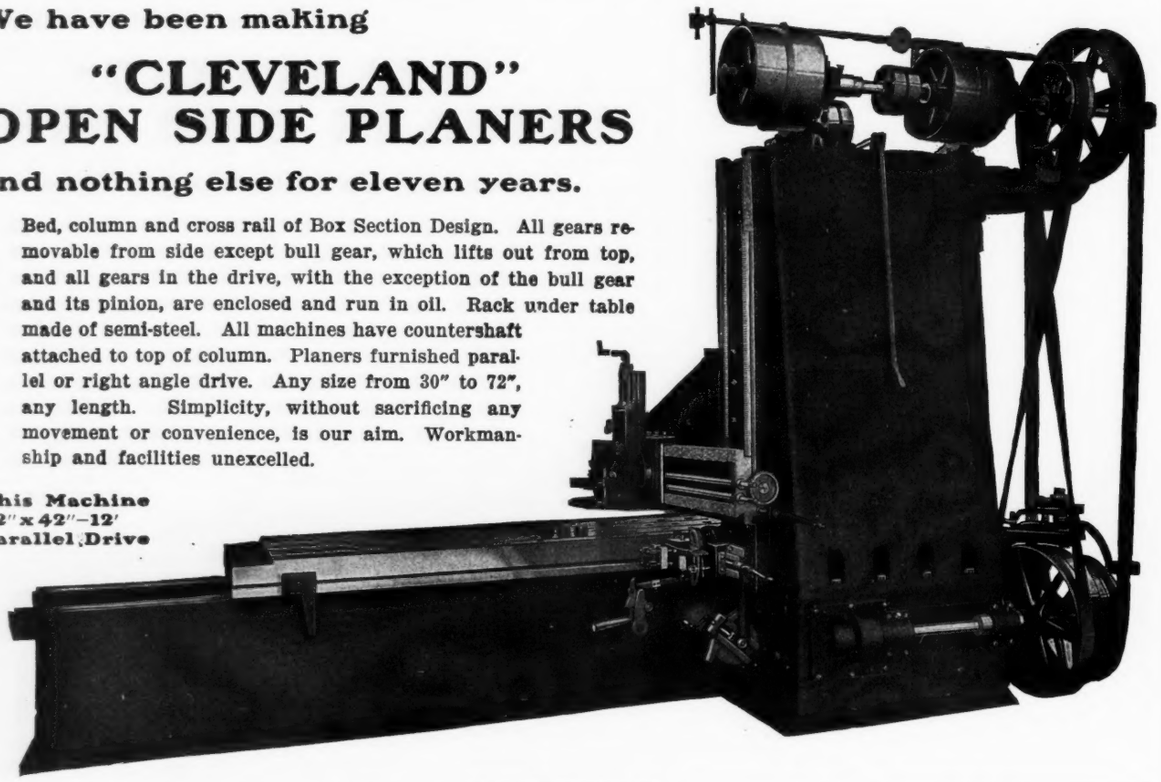
We have been making

"CLEVELAND" OPEN SIDE PLANERS

and nothing else for eleven years.

Bed, column and cross rail of Box Section Design. All gears removable from side except bull gear, which lifts out from top, and all gears in the drive, with the exception of the bull gear and its pinion, are enclosed and run in oil. Rack under table made of semi-steel. All machines have countershaft attached to top of column. Planers furnished parallel or right angle drive. Any size from 30" to 72", any length. Simplicity, without sacrificing any movement or convenience, is our aim. Workmanship and facilities unexcelled.

This Machine
42" x 42"—12'
Parallel Drive



MANUFACTURED BY

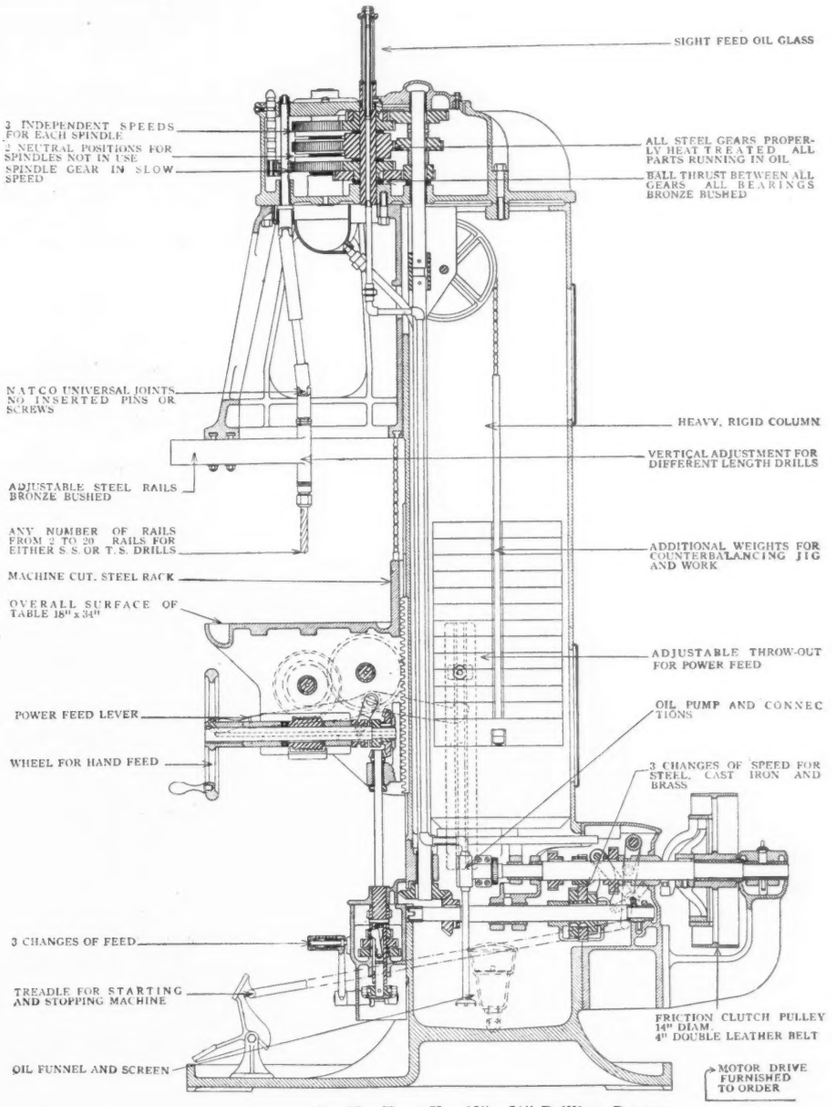
THE CLEVELAND PLANER WORKS, 3150-3152 Superior Ave., CLEVELAND, O., U. S. A.

JAMES G. DORNBIRER GEO. W. FORD

MULTIPLE DRILLING NATCO REAMING, TAPPING

NATCO MULTIPLE DRILLERS

INDEPENDENT SPINDLE SPEEDS—an exclusive feature with NATCO Multiple Drillers—give correct spindle speeds for drilling different sized holes at one time. Speeds range from 357—2249 R. P. M. Three *Independent Speeds* for each Spindle, with three Speeds for Steel, Cast Iron or Brass, give nine Speeds in all. All speed changes in Head are made while machines are running.


SIGHT FEED OIL GLASS
3 INDEPENDENT SPEEDS FOR EACH SPINDLE
2 NEUTRAL POSITIONS FOR SPINDLES NOT IN USE
SPINDLE GEAR IN SLOW SPEED
ALL STEEL GEARS PROPERLY HEAT TREATED ALL PARTS RUNNING IN OIL
BALL THRUST BETWEEN ALL GEARS ALL BEARINGS BRONZE BUSHED
NATCO UNIVERSAL JOINTS NO INSERTED PINS OR SCREWS
HEAVY, RIGID COLUMN
VERTICAL ADJUSTMENT FOR DIFFERENT LENGTH DRILLS
ADJUSTABLE STEEL RAILS BRONZE BUSHED
ANY NUMBER OF RAILS FROM 2 TO 20 RAILS FOR EITHER S. S. OR T. S. DRILLS
ADDITIONAL WEIGHTS FOR COUNTERBALANCING JIG AND WORK
MACHINE CUT, STEEL RACK
OVERALL SURFACE OF TABLE 18" x 34"
ADJUSTABLE THROW-OUT FOR POWER FEED
POWER FEED LEVER
OIL PUMP AND CONNECTIONS
WHEEL FOR HAND FEED
3 CHANGES OF SPEED FOR STEEL, CAST IRON AND BRASS
3 CHANGES OF FEED
TREADLE FOR STARTING AND STOPPING MACHINE
FRICTION CLUTCH PULLEY 14" DIAM. 4" DOUBLE LEATHER BELT
OIL FUNNEL AND SCREEN
MOTOR DRIVE FURNISHED TO ORDER

No. 37. Type K. 12" x 26" Drilling Centers

NATCO Universal Joints of latest improved design — fully guaranteed. Spindles hardened and ground, 5½" bronze bearings, ball thrust, adjusting nuts for wear.
Oil pump, sight feed oil glass, etc., for proper lubrication of all bearings are important features. Note length of bearings—bronze bushed—and that ball thrust is used wherever possible.

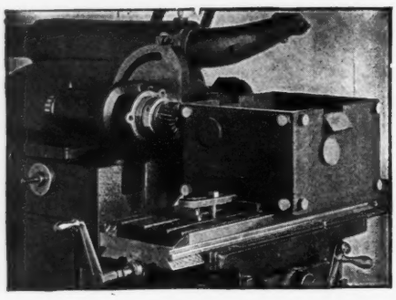
NATCO—MULTIPLE SPINDLE—MULTIPLE SPEED—DRILLERS
CORRECT SPEED—MAXIMUM FEED—FOR EACH DRILL.

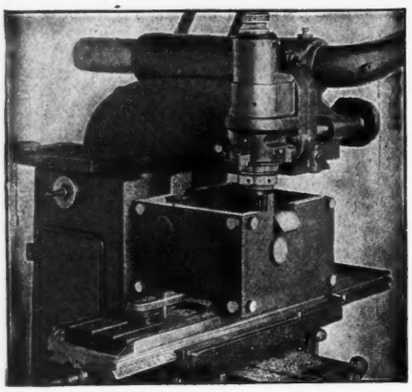
Interesting deliveries on all sizes.

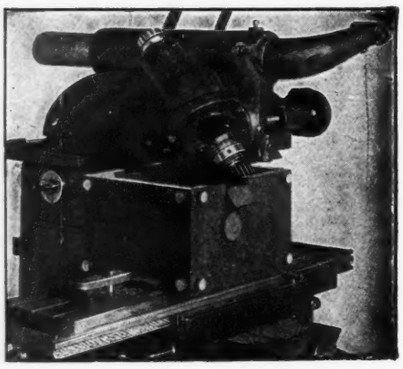
THE NATIONAL AUTOMATIC TOOL CO., Richmond, Ind., U.S.A.

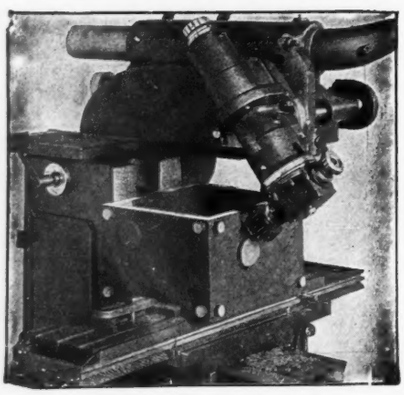
REDUCES COST NATCO INCREASES OUTPUT NATCO IMPROVES QUALITY

On Work of this Character the Van Norman "Duplex" Wins Out









Every cut made is in proper alignment and "squares up."

You can work all over this fixture with the No. 2 Van Norman "Duplex" Milling Machine without releasing the work from the table.

One of the large electrical concerns has twenty-three of this size "Duplex" Miller in use in one plant. Among other heavy buyers of these Millers is the U. S. Government.

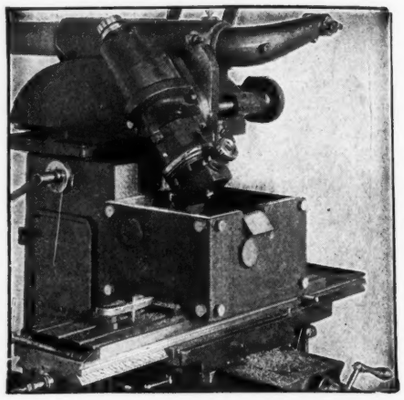
What Users Say

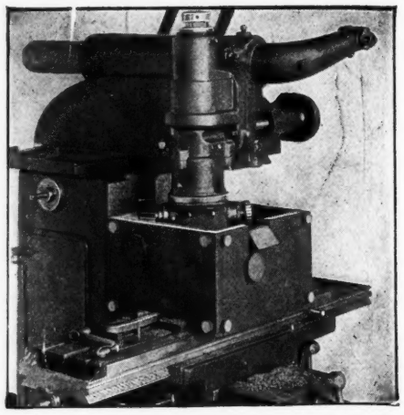
ONE USER: "If others could know this machine as I know it, you would not be able to fill your orders."

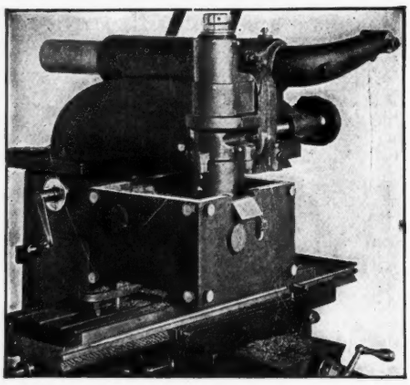
ANOTHER: "We figure this machine paid for itself in nine months' use."

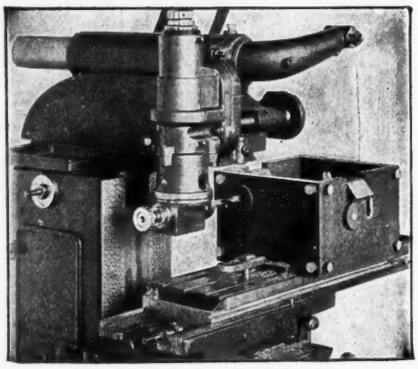
ANOTHER: "We have adopted the Van Norman 'Duplex' as our Standard Toolroom Miller and will buy no other."

We build three sizes "Duplex" Millers, Nos. 1-2, 2, 3.







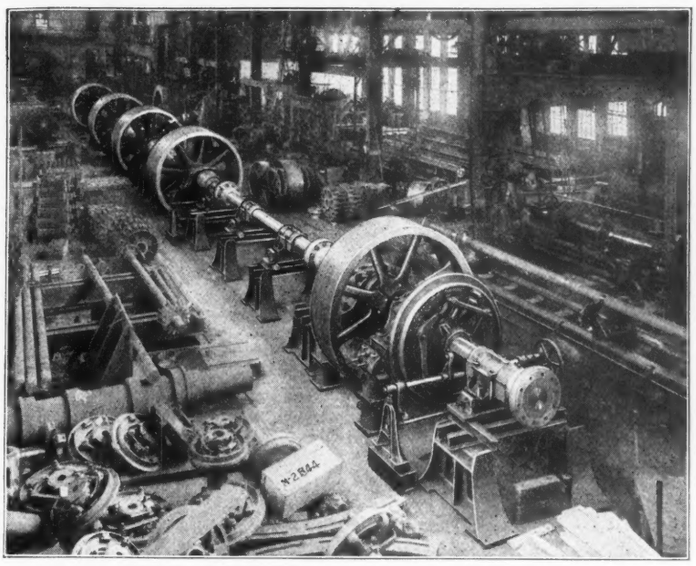


VAN NORMAN MACHINE TOOL COMPANY

Waltham Avenue, SPRINGFIELD, MASS., U. S. A.

DODGE

Established 1867
By
Wallace H. Dodge



"Most Power
for the
Least Money"

Scene in Testing and Erecting Shop of the Dodge Manufacturing Co. Mishawaka, Ind. Here all jobs receive a severe test under operation and the skilled eyes and hands of Expert Machinists.

Choice of Two Great Industries

Did you know that 40% of all the automobiles in America are made under Dodge machinery?

Did you know that 72% of all the automobile tires are turned out better and more economically because of Dodge equipment?

It's a fact—by investigation and consent.

A system that will carry a maximum load with a minimum wear and tear—with a minimum waste of power; a system easy to extend, easily and quickly replaced in case of accident; a system giving every part a lasting full value, Dodge transmission in these great industries has proved its absolute superiority over other means and methods.

Dodge is the one complete line of power transmission machinery. It conforms in every detail to the demand for safety, for efficiency, for economy. Whether your factory needs run to extra heavy equipment or to ordinary sizes, the Dodge line should be your standard. No job is too big or too intricate for Dodge facilities—no job is too small.

The services of our engineers are offered to factory executives generally. They are men of technical training, wide experience and sound judgment. This, with their constant association with transmission problems of every nature, gives them a wide practical knowledge that cannot but be of benefit to you.

We also publish a number of most desirable books dealing with the transmission problems in all lines of manufacturing. Write us specifically about your requirements. We shall be glad to answer in detail and send you proper literature.

DODGE MANUFACTURING COMPANY

Everything for the Mechanical and Economical Transmission of Power

MISHAWAKA, INDIANA

PHILADELPHIA 815 Arch St.	BOSTON 137-139 Purchase St.	CINCINNATI 126-128 W. Third St.	ATLANTA 28 S. Forsyth St.	PITTSBURGH 337 Second Ave.
CHICAGO 208-214 So. Clinton St.	NEW YORK 21 Murray St.	MINNEAPOLIS 202-204 Third St S.	ST. LOUIS 408 N. Main St.	PORTLAND, ORE. 14th and Lovejoy Sts.

Patented Universal Shaping Machines

15-inch Stroke 24-inch Stroke

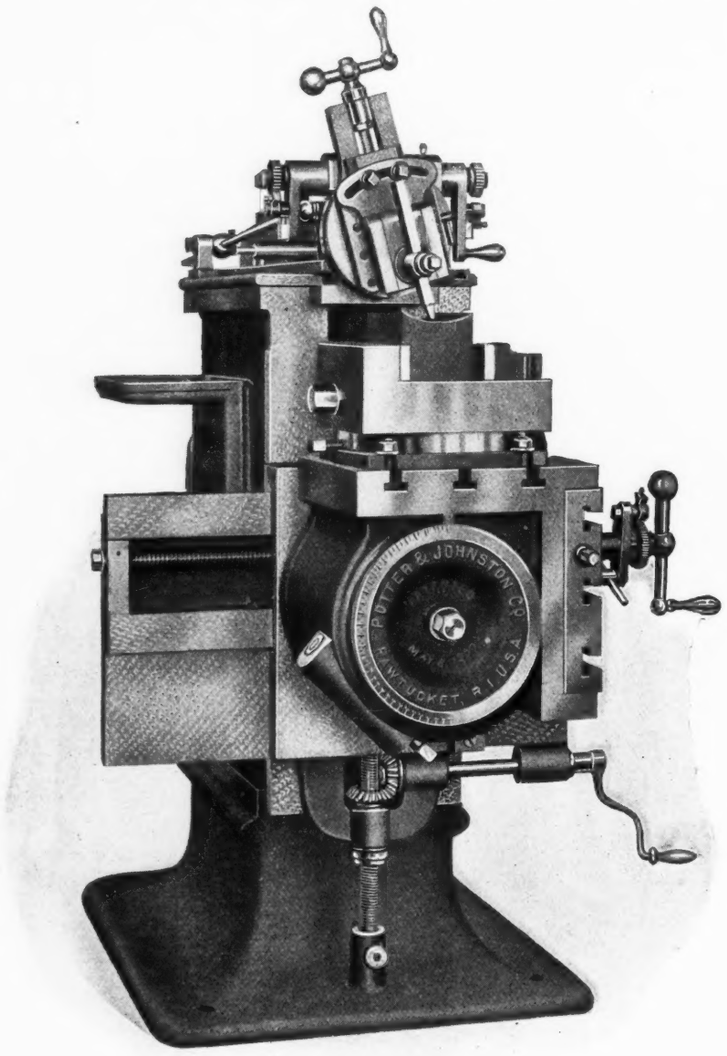
FOR EVERY SERVICE

Die Work and Tool Making — General Manufacturing Purposes — Repair Shop, Etc.

Machines are equipped with SWIVELING TABLE HAVING AUXILIARY TILTING SIDE, SWIVEL VISE WITH GRADUATED BASE, POWER DOWN FEED, AUTOMATIC FEED STOP, GRADUATED COLLARS ON TOOL HEAD FEED SCREW and TABLE FEED SCREW; also POWER RADIAL FEED TO TOOL HEAD when specified.

The UNIVERSAL Features of the machines eliminate the necessity of special vises, fixtures, etc.

15 INCH STROKE



24 INCH STROKE

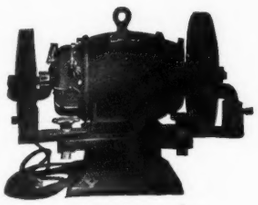
15-INCH UNIVERSAL SHAPING MACHINE

Also Manufacturing Automatic Chucking and Turning Machines. Copy of the New Book?

POTTER & JOHNSTON, Pawtucket, R. I.

OFFICES AND REPRESENTATIVES: Office for Great Britain and France: 68 Avenue de la Grand Armee, Paris, J. Ryan, Manager. New York Office: Fulton Bldg., 50 Church St., Walter H. Foster, Manager. Detroit Office: Modern Machinery and Engineering Co., 1514 Ford Bldg. Milwaukee Office: Berlin Bldg., 19th and National Aves., Chas. H. Shaw, Manager.
FOREIGN AGENTS: Chas. Churchill & Co., Ltd., London, Birmingham, Manchester, Newcastle-on-Tyne, England, and Glasgow, Scotland. Alfred H. Schutte, Cologne, Brussels, Milan, Barcelona, Bilbao. Schuchardt & Schutte, Berlin, Vienna, Stockholm, St. Petersburg, Copenhagen.

U. S. Electric Portable Tools Relieve Congested Work



Bench Grinder

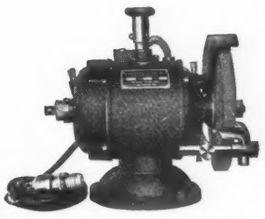
Have you found a practical, quick and satisfactory way to relieve congested work? Ever try U. S. Electric Tools? They're the greatest "systematizers" you ever saw. Wherever there's a lamp socket U. S. Portable Tools can be connected up.

Finishing Grinder

The motors are made from the finest materials, the principal feature being to obtain maximum horse power in small space, and light weight is secured by building the outer casings of aluminum. Ball thrust bearings are used throughout, the motors are air cooled, self-contained and no additional fixtures are required.

Surface Grinder

The U. S. line is complete, comprising column and breast drills, grinders and other small tools. Our catalogue illustrates several operations performed by these tools at great savings in time and labor. We call particular attention to pages 35 and 37 in the catalogue.



General Grinder

Copy today—if you say so.

THE UNITED STATES ELECTRICAL TOOL CO.

6th Avenue and Mt. Hope Street

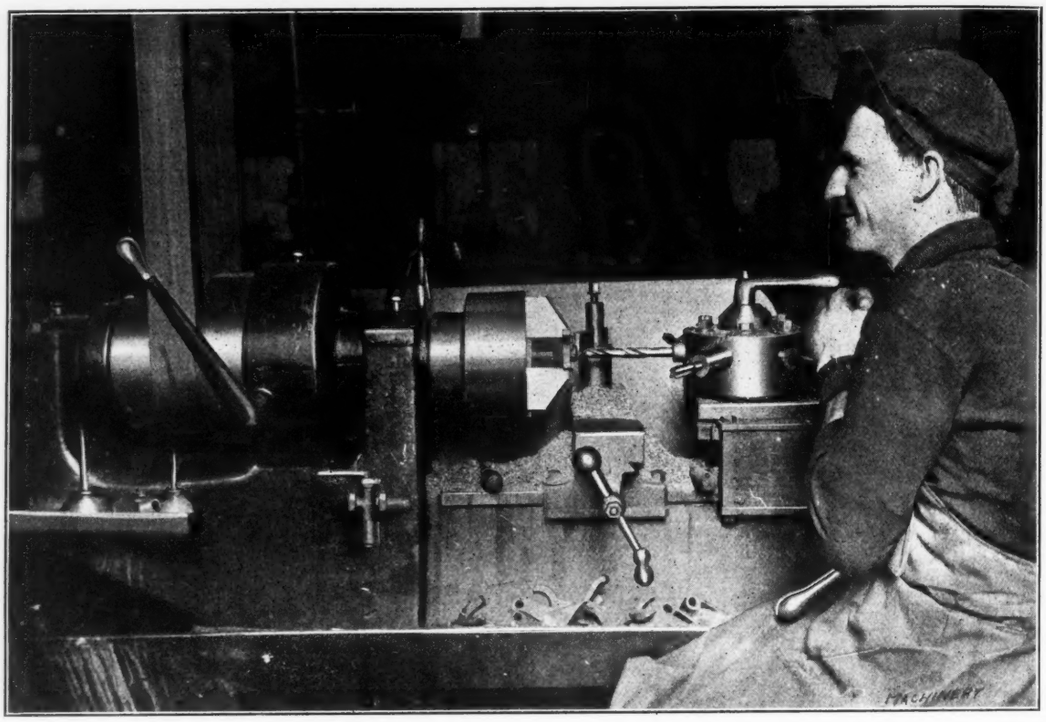
CINCINNATI, OHIO, U. S. A.

BOSTON OFFICE, 12 Pearl St.
NEW YORK OFFICE, 50 Church St.
PHILADELPHIA OFFICE, Heed Building.
CHICAGO OFFICE, 8 E. Michigan St.
ST. LOUIS OFFICE, Victoria Bldg.

FOREIGN AGENTS: The Canadian-Fairbanks-Morse Co., Ltd., Montreal, St. John, Toronto, Winnipeg, Calgary, Vancouver. Agents for Sweden, Wilh. Sonesson & Co., Malmo, Stockholm and Gothenburg. Agents for Denmark, Norway and Finland, Aktieselskabet Wilh. Sonesson & Co., Copenhagen City and Freeport. Selson Engineering Co., Ltd., London, England. J. S. Cock, Christiania, Norway. Hans Schulze, Brunn, Austria. Andrews & George, Yokohama, Japan. American Trading Co., Australia, South Africa, South America. Fenwick Freres & Co., Paris, France.

Breast Drill

MACHINING AUTOMOBILE TRANSMISSION PARTS WITH BARDONS & OLIVER TURRET LATHES

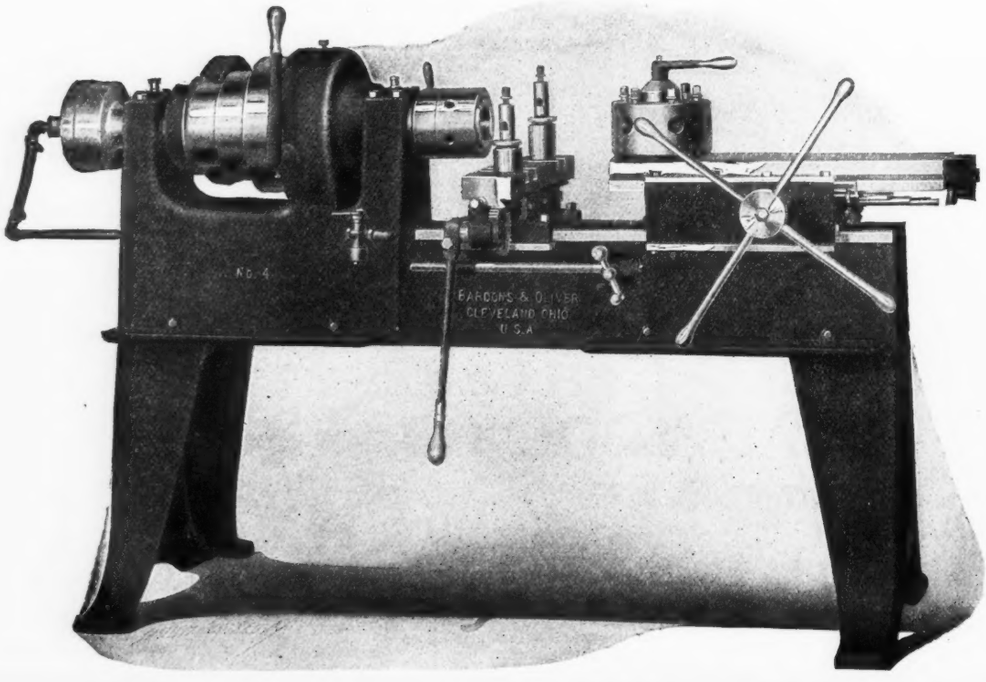


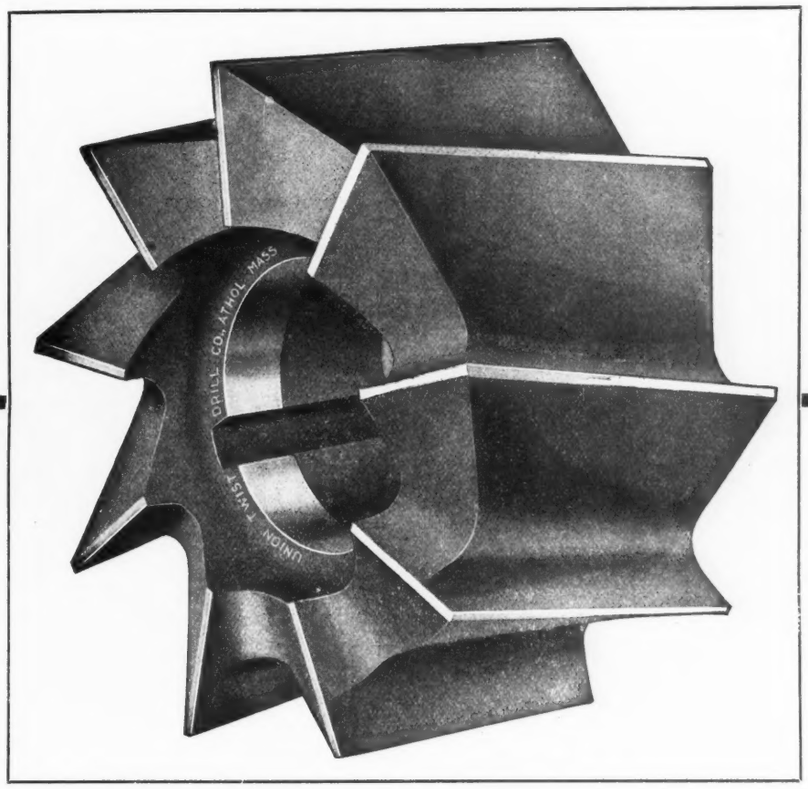
This is one of the jobs the Reo Motor Car Company at Lansing, Mich., have put up to B. & O. Machines with great success. They face, drill and tap transmission gear shifting forks at the rate of 500 completed castings in 9 hours.

The work is gripped securely by an air chuck while the boss is faced, an 11-16" hole drilled completely through it, and a 3-4" by 16 p. tap run through. As the castings are tough bronze, this is hard cutting.

Bardons & Oliver Turret Lathes are adapted for many lines of manufacture. The tooling system is very complete, the latest devices for driving, safeguarding both operator and work, and securing accurate, satisfactory results are embodied in their design. *Write for latest catalogue and full details of the B. & O. line of machines.*

BARDONS & OLIVER, Cleveland, Ohio





Plenty of Chip Room

Now is a good time to investigate

END MILLS

HIGH SPEED STEEL COARSE TEETH

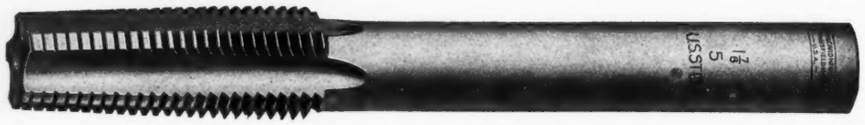
This and other cutters were developed in the Works of the Cincinnati Milling Machine Company by actual experiments. The results obtained from Cutters with Coarse Teeth will interest you.

MADE AND CARRIED IN STOCK BY

UNION TWIST DRILL COMPANY

ATHOL, MASSACHUSETTS, U. S. A.

Makers of CUTTERS and DRILLS



Card Screw Cutting Tools
The Assistants of Experts

¶ For over thirty-eight years we have supplied Card Screw Cutting Tools to men in all mechanical fields. The inventor who requires accurate, special service orders "Card"; the mechanic, whose results give him his standing, demands "Card"; technical men everywhere know by actual service how good Card Tools are.

¶ Neither money nor time has been spared in making Card Tools as fine as modern industry demands. Their universal adoption by men to whom only the highest grade tools are good enough is sufficient proof of "Card" quality.

¶ Our illustrated catalogue lists "Card" Dies, Die Holders, Guides, Taps and Screw Plates.

¶ Draw a Card if you would win the prize for Quality Workmanship.

S. W. Card Manufacturing Company
MANSFIELD, MASS., U. S. A.

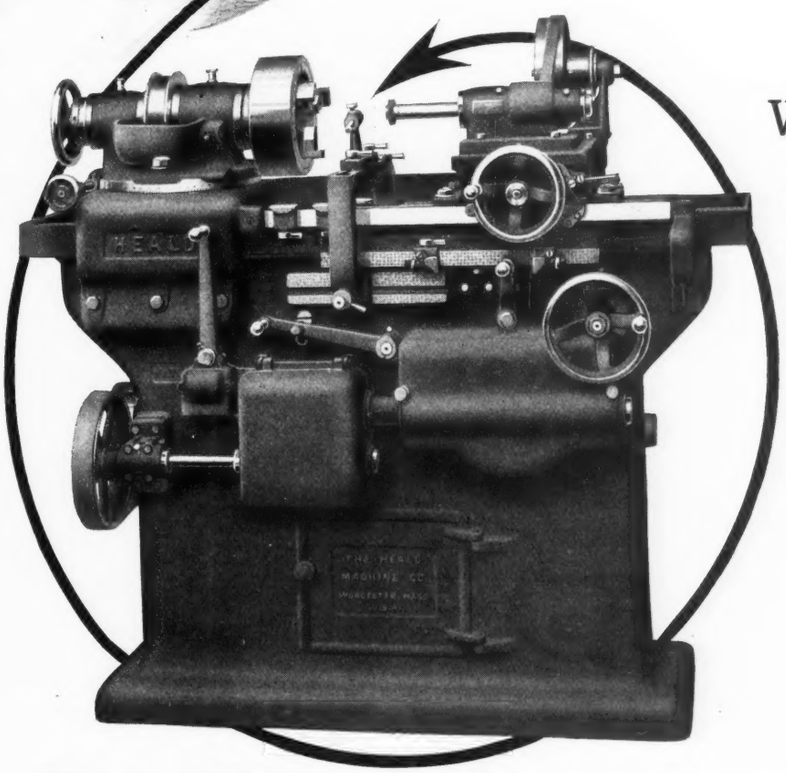
EUROPEAN AGENTS: Chas. Churchill & Co., London, Birmingham, Manchester and Glasgow; Markt & Co., Ltd.; A. A. Kamfraath (Brussels), Ltd., Brussels; Hans Schulze, Vienna and Bruen, Austria, Paris; Fenwick Freres & Co., Turin; Ignacz Szekely, Budapest; V. Lowener, Stockholm, Copenhagen, Christiania; Andrews & George, Yokohama, Tokio, Osaka; J. Lambercier & Co., Geneva.

Having Trouble
Getting Round Straight Holes?
Grind them with a

HEALD INTERNAL GRINDER

The
MACHINE
WITH A
SINGLE PURPOSE

TO
GRIND
GOOD HOLES FAST



We Guarantee
the Machine
and the
Production

Send us
samples of
work that
bothers and
let us show
YOU

THE HEALD MACHINE COMPANY
WORCESTER, 20 NEW BOND STREET, MASSACHUSETTS

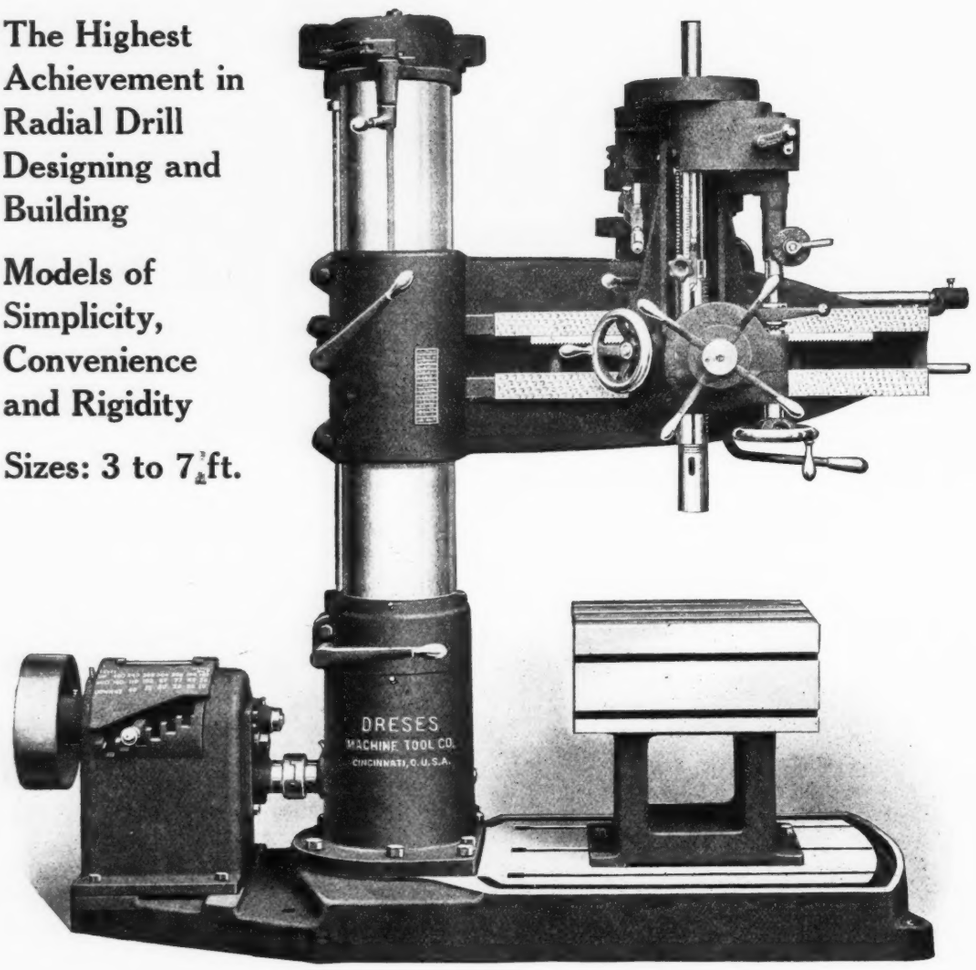
NEW!

DRESES HIGH DUTY 3 AND 3½ FT. RADIAL DRILLS

The Highest Achievement in Radial Drill Designing and Building

Models of Simplicity, Convenience and Rigidity

Sizes: 3 to 7 ft.



Annular and Thrust Ball Bearings in all places essential.
Steel Gears and Phosphor Bronze Bushings.
Oil Bath for all High Speed Gears.

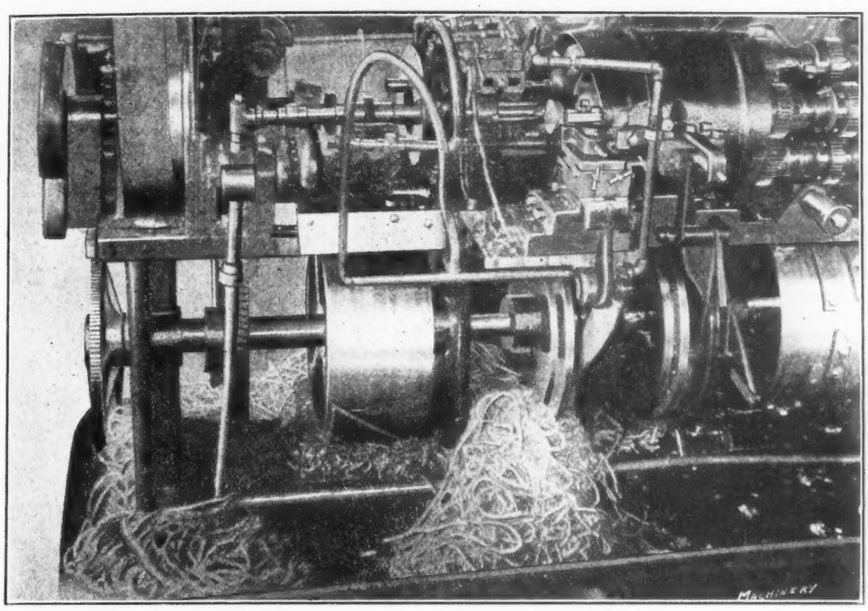
DRESES MACHINE TOOL CO.

CINCINNATI, OHIO, U. S. A.

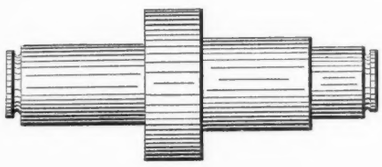
REPRESENTATIVES: Manning, Maxwell & Moore, New York, Boston, Philadelphia, Cleveland, Chicago, Detroit, Atlanta, Mexico City and Yokohama; Carey Machinery & Supply Co., Baltimore; Baird Machinery Co., Pittsburgh; Wm. C. Johnson & Sons Machy. Co., St. Louis; Mine & Smelter Supply Co., Denver and Salt Lake City; Pacific Tool and Supply Co., San Francisco and Los Angeles; Schuchardt & Schutte, London, Berlin, Vienna, Prague, Budapest and Stockholm; Moscow Machine Tool & Engine Co., Moscow; E. Sonnenthal, Jr., Koln; Stussi & Zweifel, Milan; R. S. Stokvis & Zonen, Rotterdam, Brussels and Paris; Shewan Tomes & Co., Shanghai, Peking and Canton; Castle Bros., Wolf & Sons, Manila.

THIS PIECE—35 SECONDS

NEW BRITAIN AUTOMATICS

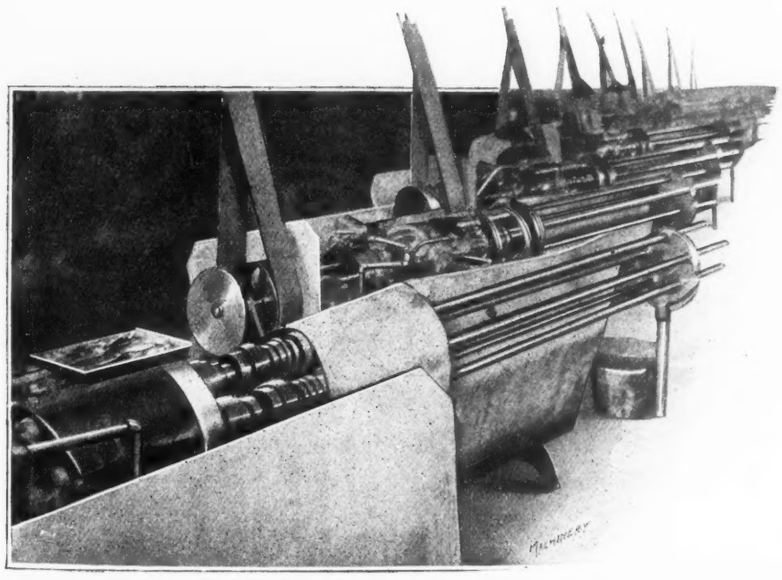


The "New Britain" Automatic Screw Machine (Multiple Spindle type) is a producer. This piece, actual size, is evidence of the fact—a steel stud for motor cycle use, five diameters and two formed ends, made from cold rolled steel in thirty-five seconds. You can see for yourself, by the chips around the machine, that "some turning" is being done.



On this job the operations are as follows: First, Form; second, Shave and box-mill; third, Mill up to the head; fourth, Cut Grooves at outer end and size shoulder; fifth, Cut off.

Don't forget the time, *thirty-five seconds*. Compare this with any job you are doing now on any other screw machine. The "New Britain" Automatic Screw Machine has five spindles—a 20% advantage over four spindles at the very outset. Wouldn't you like to know more about it?



Send for catalogue with specifications, etc. We manufacture "New Britain" Automatic Chucking Machines also—see page 12.

THE NEW BRITAIN MACHINE CO.

64 Bigelow Street

NEW BRITAIN, CONN.

AGENTS: Alfred H. Schutte, Paris, Cologne, Brussels, Milan, Bilbao, Berlin and St. Petersburg. Schuchardt & Schutte, London.

Trade Mark

On Their Metal

The reputation of "Detroit" Tools rests largely on the steel that goes into them. Our Buyer is an expert and every piece of metal we use is selected because of its perfect adaptability to the exacting demands of "Detroit" Drill standards.

This steel is treated and tempered by men whose knowledge and experience perfectly qualify them for such vitally important work.

"Detroit" Twist Drills

Our equipment is the most modern and the most scientific that a scientific age affords and every drill passes through the inspector's hands from three to eight times in the process of making.

No variation greater than the 1-2000 of an inch is allowed in any but the larger sizes and every other operation is characterized by the same degree of accuracy.

In competitive tests "Detroit" Drills have proved that they cut faster through more metal without grinding than other makes.

Send for Catalogue "F" and prove this in your shops.

Trade Mark

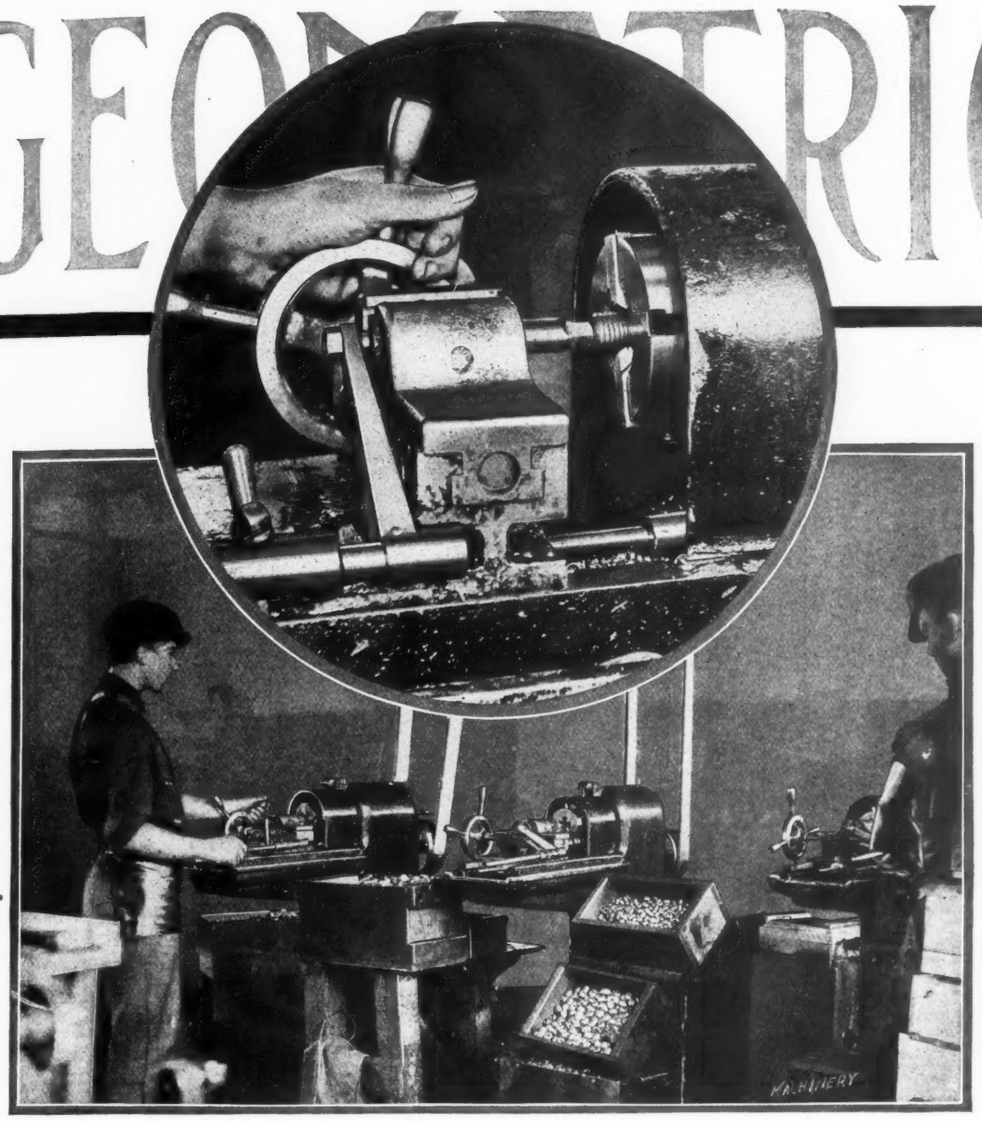
384

DETROIT TWIST DRILL COMPANY

600-612 Fort Street, Detroit, Michigan

1926 Wabash Ave., Chicago *633 Market St., Philadelphia* *30 Church St., New York*

GEOMETRIC



The Economy of Geometric Threading Machines

for threading a great variety of small parts is recognized in the most up-to-date shops — especially are they valuable as adjuncts to the screw machine, as frequently threading can be treated as a second operation following the forming of the piece on the screw machine.

The engravings, made from views taken at the New Haven Machine Screw Company's shops, are representative of Geometric adaptability. The larger picture shows three of the machines at work on Foster Safety Set Screws, thousands of which are threaded each day. The upper view shows the method of holding and threading the screws; the carriage is fitted with a steel arbor, on the end of which the screw blank fits, carriage is then run up to the die and the thread started. As the self-opening Geometric Die opens automatically, the work can be pulled back and removed rapidly.

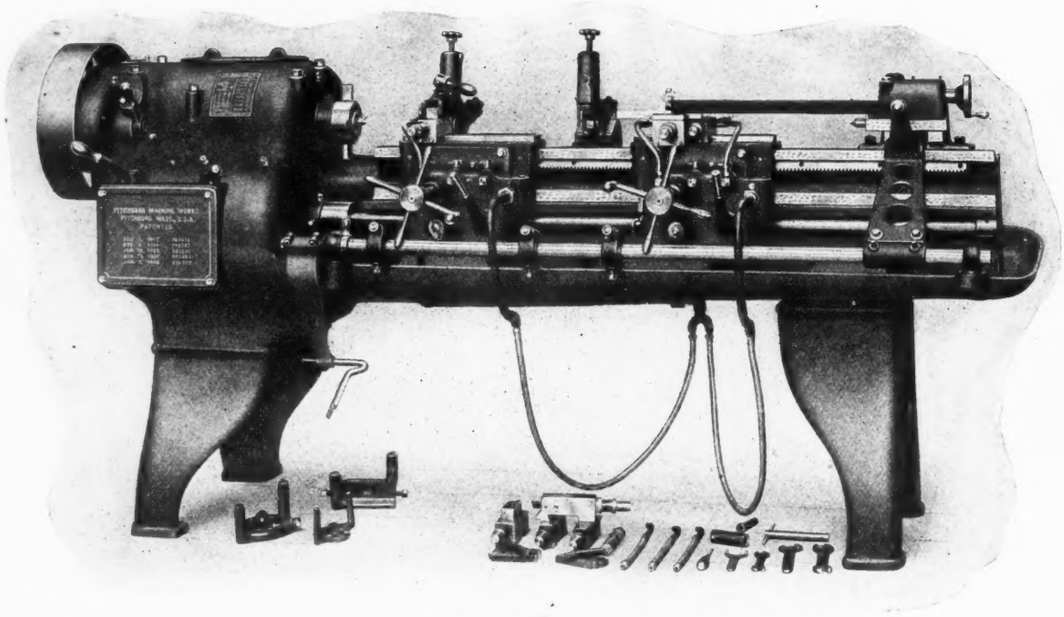
Skilled labor is in no way essential with these machines.

We shall be glad to forward Special Booklet describing this machine —or booklet of any of the well-known Geometric Tools. Write us.

THE GEOMETRIC TOOL COMPANY

NEW HAVEN, CONN., U. S. A.

PACIFIC COAST AGENTS: The Compressed Air Machinery Co., San Francisco, Cal. **FOREIGN AGENTS:** Chas. Churchill & Co., Ltd., London, Birmingham, Manchester, Newcastle-on-Tyne. Alfred H. Schutte, Cologne, Brussels, Paris, Milan, Bilbao. Schuchardt & Schutte, Vienna, St. Petersburg, Stockholm, Berlin. **CANADIAN AGENTS:** The A. R. Williams Machinery Co., Ltd., Toronto. Williams & Wilson, Montreal.



Not a Record "Lo-Swing" Performance

But Can You Duplicate It?

These little shafts are only 14" long. They have six diameters, the largest 1¾", and one finished section. Material is machine steel. "Lo-Swing" production on this work is fifteen completed shafts every three hours—turning efficiency which you won't equal without "Lo-Swing" equipment.

The work is done in two operations, the tools for both being set up on one carriage. In the first operation the tapered end of the shaft and the adjacent sections are turned using three tools on the carriage, one of course being operated by the taper turner. The middle shaft of the three in front of the machine shows the result of this operation, after which the piece is reversed and the remaining tools of the set-up are advanced on the carriage to proper distances, so as to clear the other tools, then the other end of the work is machined, leaving the shaft finished as shown at the right-hand end of those in front of the machine.

Perhaps you are turning work which could be handled more economically on the "Lo-Swing" Lathe. We'll be glad to demonstrate the advantages of

"The Multiple Turning Habit"

May we have that opportunity?

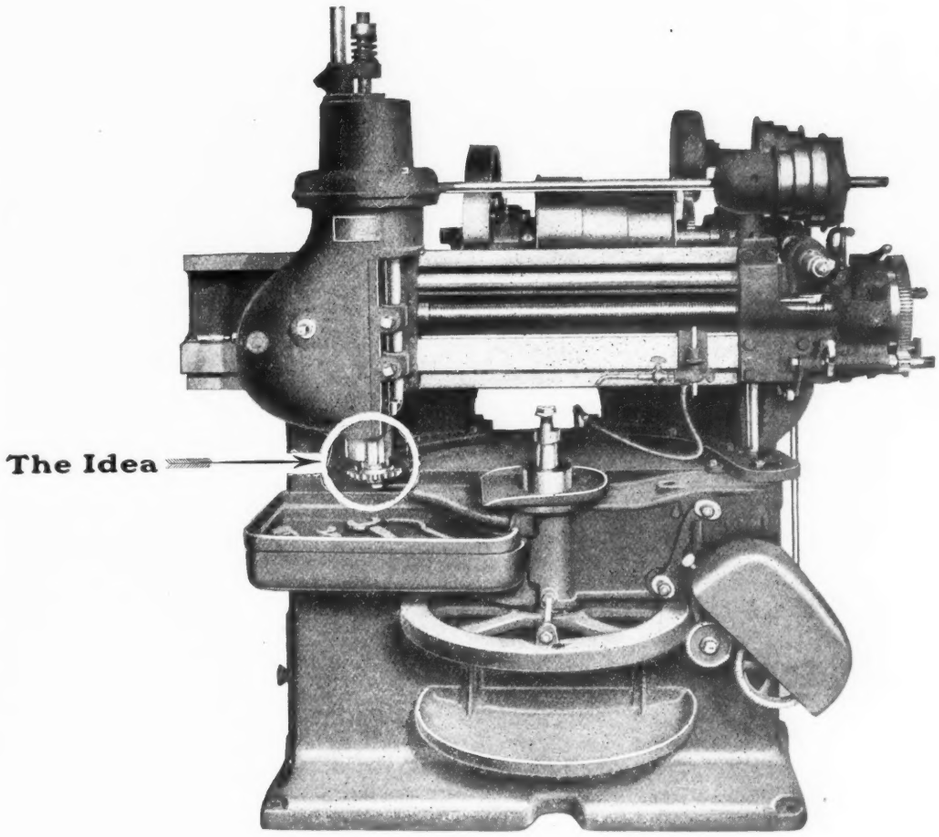
FITCHBURG MACHINE WORKS, Fitchburg, Mass., U. S. A.

SOLD DIRECT BY OUR REPRESENTATIVES IN THE UNITED STATES AND CANADA

FOREIGN AGENTS: Alfred H. Schutte, Paris, Brussels, Cologne, Berlin, Milan, Barcelona. Schuchardt & Schutte, Vienna and St. Petersburg. Buck & Hickman, London, Birmingham, Manchester, Glasgow. F. W. Horne, Tokio, Japan.

"BUILT AROUND AN IDEA"

The Phrase that Explains the Gear Shaper



The central idea of the Gear Shaper is the cutter—the generated cutter, ground to a true involute *after* hardening.

Such a cutter has unequaled possibilities in the matter of adaptability, output and accuracy.

The Gear Shaper itself was designed to apply the ideal virtues of the cutter to the practical everyday work of removing metal and forming gear teeth. The convenience, producing capacity and accuracy of the cutter are thereby made available to their fullest extent for actual work—*for your work.*

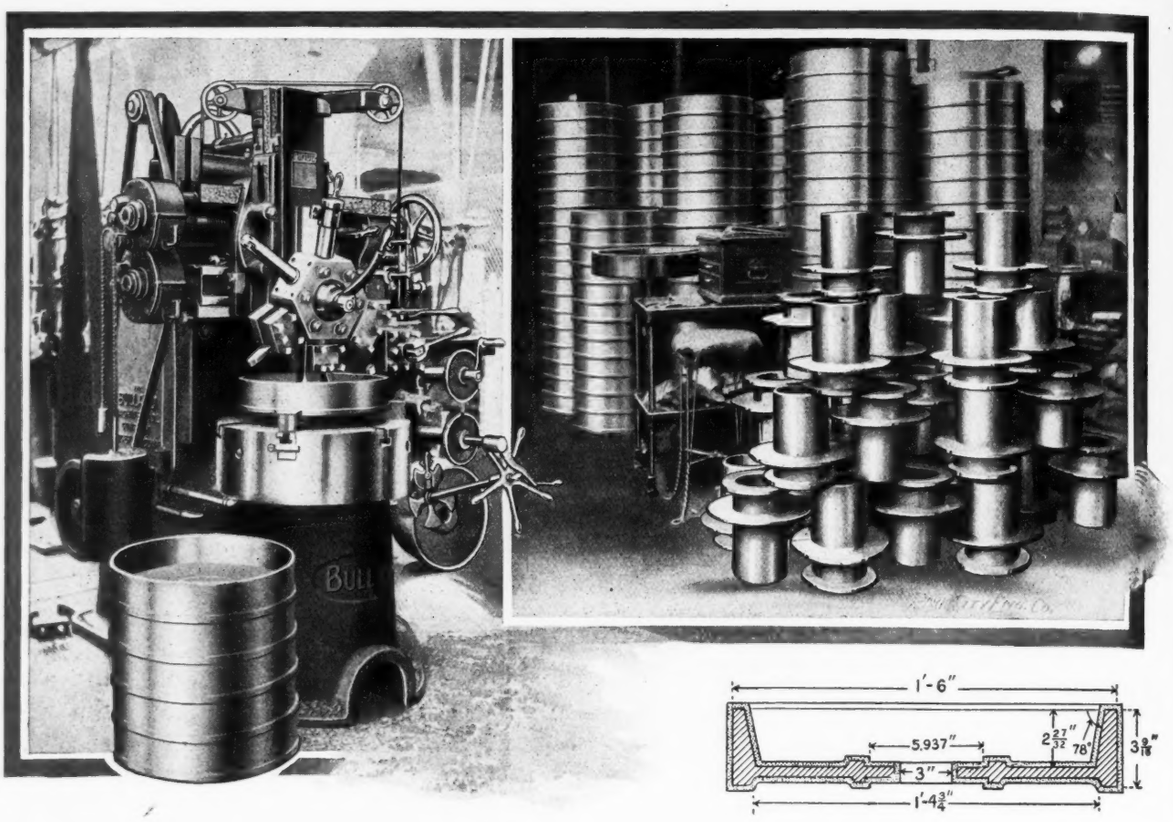
By reading these advertisements from month to month, you will get, we hope, a clear idea of the solid virtues of the Gear Shaper.

But don't wait for this "continued-in-our-next" description. If you harbor the uneasy suspicion that your gear work could be improved, either in quality or output, drop us a line. We will go over the whole matter with you *personally—right now.*

THE FELLOWS GEAR SHAPER COMPANY

25 Pearl Street **SPRINGFIELD, VERMONT, U. S. A.**

FOREIGN AGENTS: Henry Kelley & Co., Manchester, Eng. M. Koyemann, Dusseldorf, Germany. Ph. Bonvillain and E. Ronceray, Paris, France. White, Child & Beney, Vienna, Austria. Adler & Eisenschitz, Milan, Italy. The C. & J. W. Gardner Co., St. Petersburg, Russia.



Close Limits and Fast Time

are attributes of the **Bullard Vertical Turret Lathe** on automobile work that make it a power in this special line of manufacture. It is not only a pace-maker on production and accuracy, but the machine that stands up on the "long grind"—the machine to assure "results," with the least possible demand on the operator—either mental or physical.

A typical Bullard automobile job is shown in the photograph, taken at the plant of the Pierce Arrow Motor Car Co. at Buffalo—piles of work in the background, the job on the machine.

The 18 inch fly-wheel shown in process is finished all over, as indicated in line drawing (in two settings), at the rate of thirty-five minutes per piece, averaging sixteen wheels per day for a run extending over several weeks.

Accuracy and high-quality finish are prerequisites in Pierce Arrow work and the results obtained from the first machine warranted the installation of others.

The truck hubs shown in the foreground of the picture constitute another good Bullard job; they are made from steel castings and finished all over; the size limits calling for very accurate work.

The Vertical Turret Lathe

saves time on the single piece or the small lot as well as on the "big run."

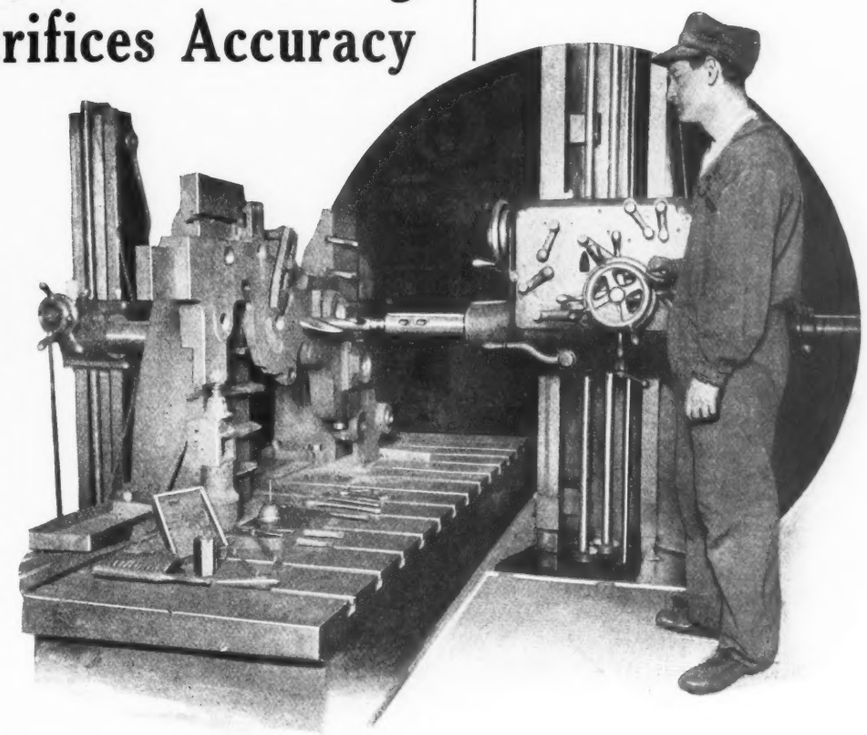
The features which "cut time between cuts" and "cut the cutting time" make proportional savings whether the lot be large or small.

If you are still "without" the Vertical Turret Lathe in your shop, you need our literature—a word will bring it, ask for Catalog MV-22.

THE BULLARD MACHINE TOOL COMPANY

BRIDGEPORT, CONN., U. S. A.

We All Know that Resetting Usually Sacrifices Accuracy

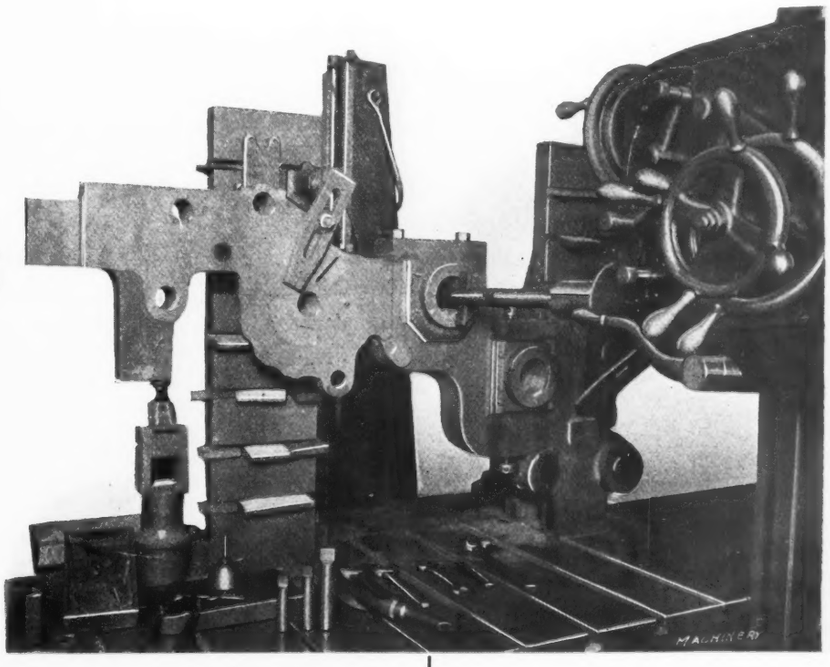


Still, you'll see it done in many shops.

We all know time required to line up work when resetting it is time w a s t e d — for manufacturers of m o d e r n machines have shown how to complete all operations of a like nature at a single setting.

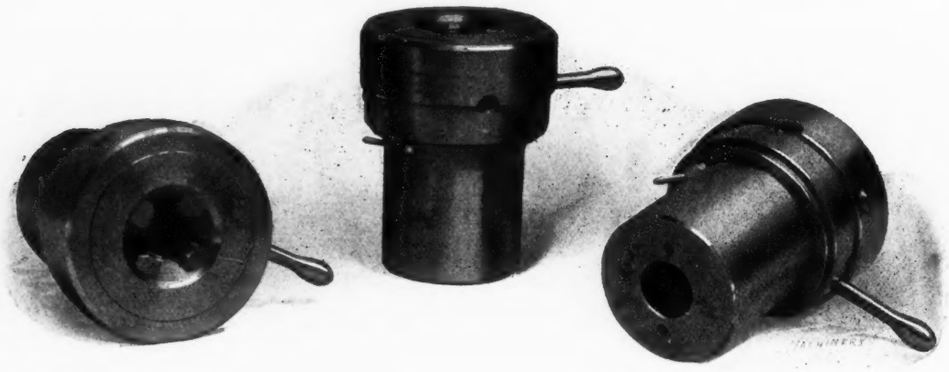
Boring holes in the huge frame sections of modern printing presses is a good demonstration of "Rochester" capacity. The several sections must come together in absolute alignment. All holes, and there are ten in this particular piece, ranging from ¼″ to 4″ diameter, must be bored accurately, both in size and relative distance—"Rochester" work most assuredly—for the holes are located relative to each other within limits of 0.0005″ by the machine itself at a single setting of the piece. You can't beat that!

Get book No. 14 for more about Rochester Boring, Milling, Drilling and Tapping Machines and their advantages.



ROCHESTER BORING MACHINE COMPANY

ROCHESTER, N. Y.



The Hartness Automatic Die Holder

offers threads truer in lead and truer to size than you can get by any other die-cutting process known. This is not selling talk pure and simple. There are definite features of design or construction back of every claim; and there is an uninterrupted experience of fifteen years back of the manufacture and use of these Dies that furnishes the ground work of their reputation.

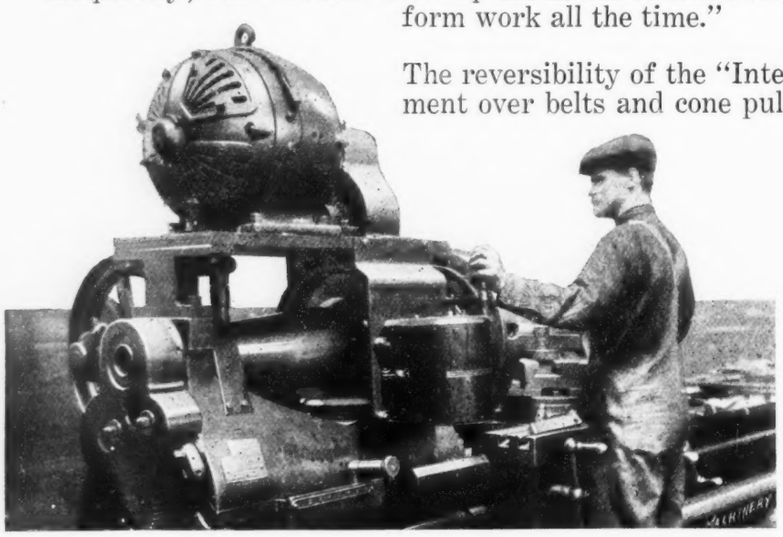
JONES & LAMSON MACHINE COMPANY, Springfield, Vt., U. S. A.

97 Queen Victoria Street, London, E. C.

AGENTS: E. A. Kinsey Co., Cincinnati, Ohio; Boyer-Campbell Co., Detroit, Mich.; Robinson, Cary & Sands Co., St. Paul, Minn.; E. L. Essley Machinery Co., Chicago, Ill.; Pacific Tool & Supply Co., San Francisco, Cal.

The Motor with the Trouble Left Out

"We have no trouble at all with the "Interpole," says the Chief Electrician in the machine shop where this 5 H. P. *Interpole Motor* is driving a 24" Lodge & Shipley Lathe. "We take cuts 1-2 inch deep and use a 1-16 inch feed quite frequently; but it doesn't slow up the motor or cause it to spark, and we get uniform work all the time."



The reversibility of the "Interpole" is a big improvement over belts and cone pulleys for thread cutting; the constant speed at all loads, high efficiency, compactness and light weight, instant speed change, *overload without sparking*, small installation and upkeep expense, and the superior mechanical and electrical construction are other features you should know more about.

Our catalogue will help you decide. A card will bring it by return mail.

THE ELECTRO-DYNAMIC COMPANY, Bayonne, N. J.

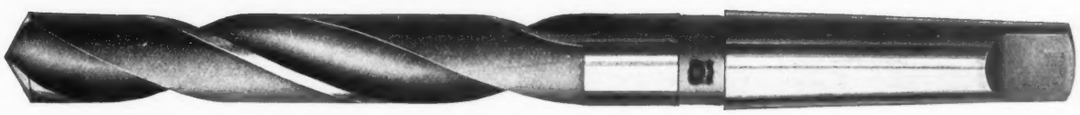
Arcade Building, PHILADELPHIA, PA. Westinghouse Building, PITTSBURGH, PA. Peoples Gas Building, CHICAGO, ILL.

ACCURACY

IS A LEADING FEATURE OF

THE STANDARD TOOL CO'S "SHIELD BRAND" DRILLS

CARBON AND HIGH SPEED STEEL
ALL STYLES



USING the best material and appliances, and only employing the most skilled workmen give our Drills their splendid working qualities.

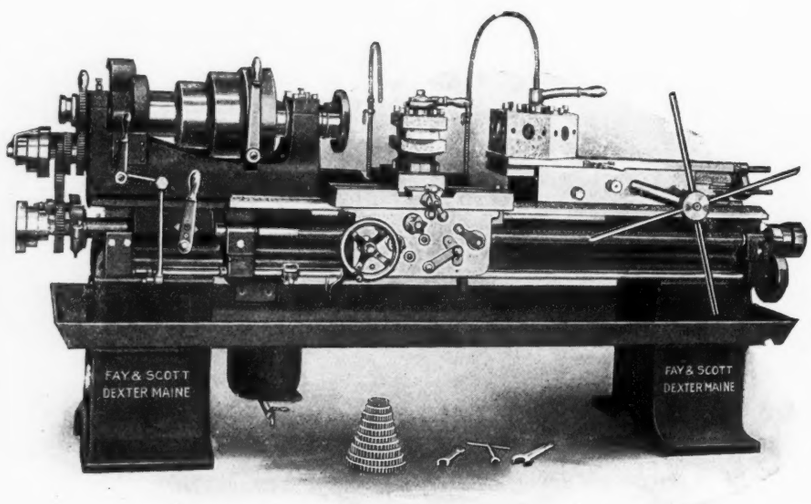
They are indispensable tools for economical drilling.

THE STANDARD TOOL CO.

CLEVELAND, OHIO

New York Store at . . . . . 94 Reade Street
Chicago Store at . . . . . 552 W. Washington Blvd.

London—C. W. Burton, Griffiths & Co. Copenhagen—Nienstaedt & Co. Geneva—J. Lambercier & Co.
Brussels—Honore Demoor & Cie. Paris—Burton Fils. Tokio—F. W. Horne.



FAY & SCOTT 20-INCH UNIVERSAL TURRET LATHE

The Confidence that Quality Gives

Stated quality and *tested* quality are two entirely different things. That quality which has been tested by actual use is a basis for confidence in any machine. Fay and Scott Universal Turret Lathes have been given thorough trial in many shops, and as a result are now permanent fixtures. They are especially adapted for the manufacture of duplicate parts from bar stock and castings and have a capacity equal to several engine lathes.

A 6-1 ratio of double back gearing, the ability to cut threads from 2 to 24, a 16″ turret slide feed, together with many other valuable assets for the busy shop, are embodied in Fay & Scott construction.

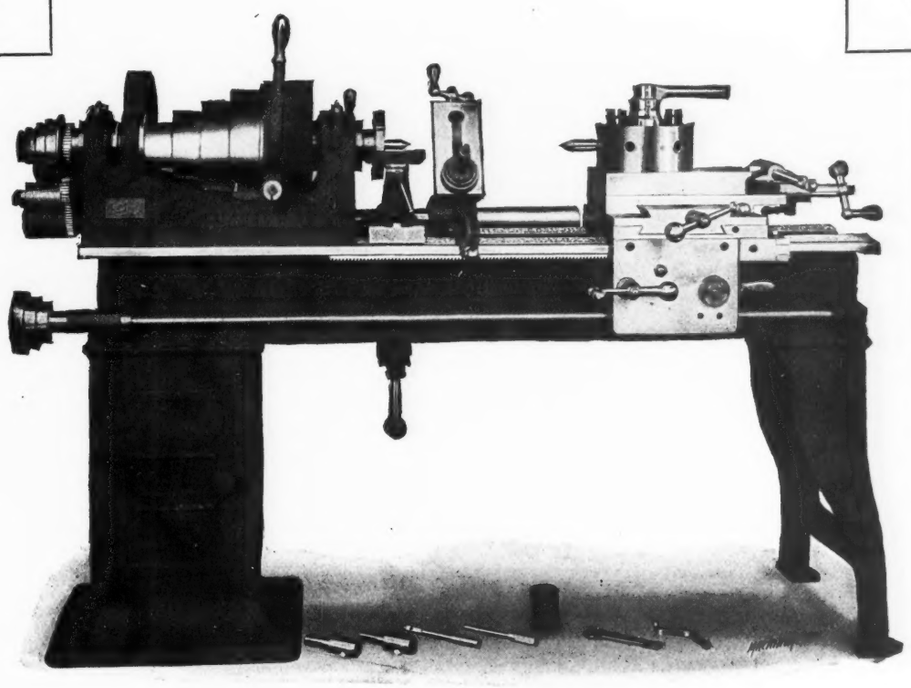
Write for catalogue.

THE PRENTISS TOOL & SUPPLY CO., New York

SINGER BUILDING, 149 BROADWAY

BOSTON, MASS. John Hancock Bldg. | SCRANTON, PA. 720 Prescott St. | SYRACUSE 520 University Block | ROCHESTER 315 E. & B. Building | BUFFALO 607 D. S. Morgan Building

Warehouse: 439 Communipaw Ave., Jersey City, N. J.



A "Springfield" for Brass Work Means Profit for Manufacturers

Such a variety of brass machining is possible on this (Fox Type) Springfield Turret Lathe that its use in *your* shop means money in *your* pocket. Design meets with instant favor wherever seen, and fast and accurate production explain the great increase in the sales of this lathe.

The turret has many possible combinations—provided with hand longitudinal and cross feeds and also power longitudinal feed in either direction. The friction head is a special feature and the chasing attachment, which is heavy, accurate and arranged to cut right- or left-hand threads without changing the leader, is another of the many *good things* which make the "Springfield" Turret Lathe popular.

All our lathes are built with great care and under the supervision of experts. Three sizes of this (Fox Type) Lathe—20″ x 7′, 18″ x 6′ and 15″ x 5′. Circular No. 105 tells the story. Ask for a copy.

THE SPRINGFIELD MACHINE TOOL CO.

631 Southern Avenue **SPRINGFIELD, OHIO, U. S. A.**

Agents for Chicago: The E. L. Essley Machinery Co. Toledo, Ohio: The Coghlin Machinery & Supply Co. Cleveland, O: Brandes Machinery Co. Pittsburgh, Pa.: Somers, Fitler & Todd Co. Detroit, Mich.: C. E. Fales Machinery Co. Italy: Stussi & Zweifel, Milan. Germany: Ludw. Loewe & Co., Berlin. France: Alfred Herbert, Paris.

PATENT SECTION I & Z

Section I saves 45 per cent in weight.

Section Z saves 35 per cent in weight.

NOVO HIGH SPEED STEEL, for Patent Section, Lathe, Planer and Cut-off Tools.

Stronger than solid tools. Require no re-forging—simply grind to shape and reharden. No waste.

Bar steel in stock in following sizes:—

Section I	Section Z
3/8 x 3/4	3/8 x 3/4
1/2 x 1	1/2 x 1
5/8 x 1 1/4	5/8 x 1 1/4
3/4 x 1 1/2	3/4 x 1 1/2
	1 x 2

We also carry a complete line of tools, ground and ready for use, in stock.

Ask for price list.

Section I

Section Z

HERMANN BOKER &

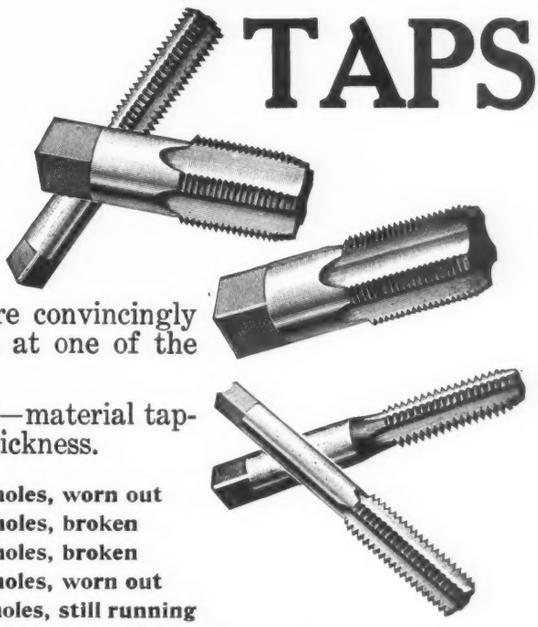
CHICAGO

Pacific Tool & Supply Co., San Francisco,

Its Proof of Quality far beyond Carbon Tool Steel is best shown in

Will not shrink.
Exceptional torsional strength.
No stripping of teeth.
Increase of speed 25% to 50%.
Splendid for tapping cored holes.

TAPS



The advantages of INTRA STEEL for taps are convincingly shown in the following record of a test run at one of the largest representative shops of the east.

In this test, size of taps was ⅜″—R. P. M. 435—material tapped, iron castings varying from ¼″ to 1″ in thickness.

RESULTS SHOWED:

Tap No. 1, 10,062 holes, broken
Tap No. 2, 17,014 holes, worn out
Tap No. 3, 14,266 holes, broken
Tap No. 4, 16,676 holes, broken
Tap No. 5, 11,845 holes, worn out
Tap No. 6, 20,514 holes, broken
Tap No. 7, 9,640 holes, broken
Tap No. 8, 12,801 holes, worn out
Tap No. 9, 11,603 holes, still running

Average of 9 Intra Taps 13,825 holes per tap and tap No. 9 is still running.

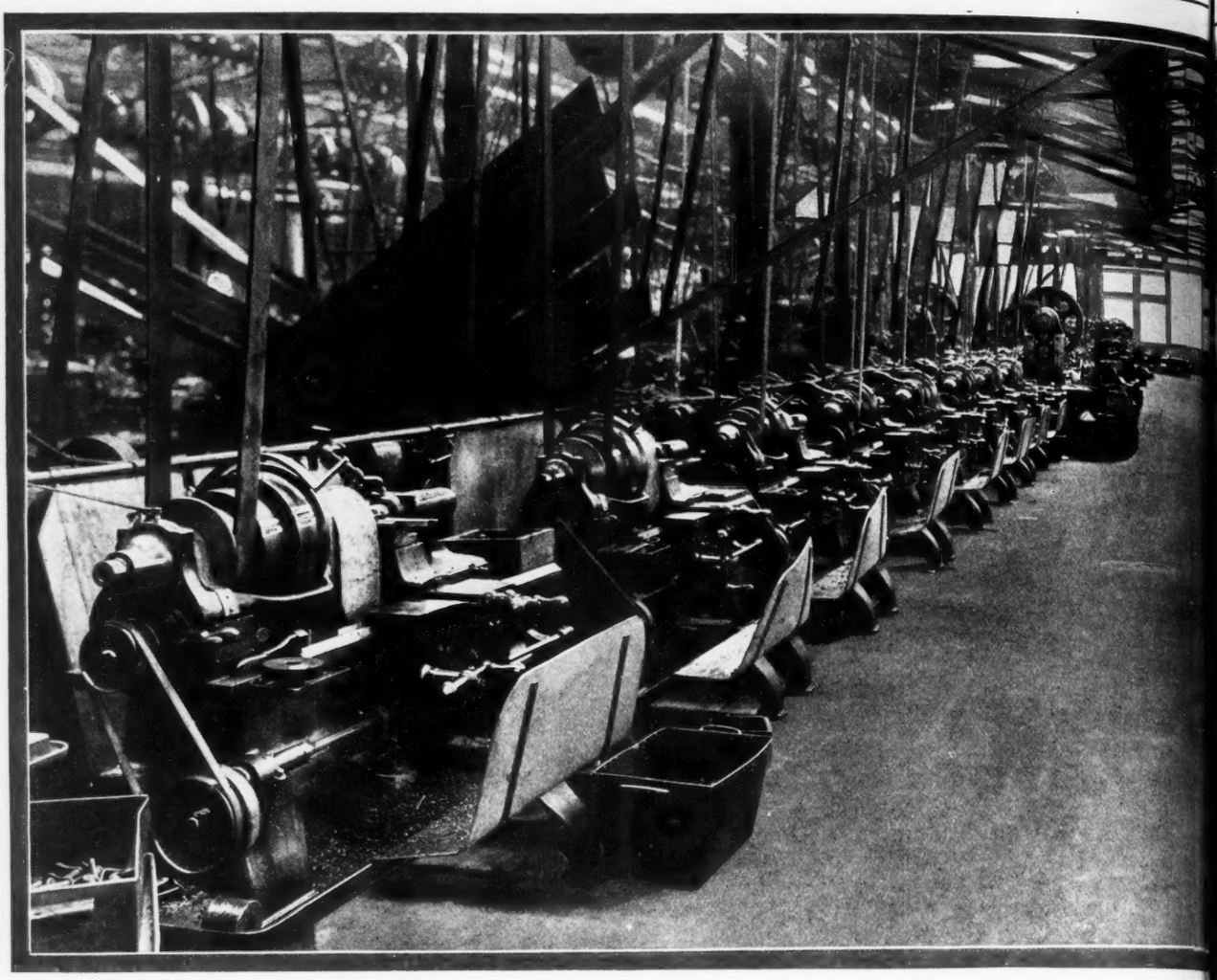
The life of a tap made of the very best crucible carbon tool steel averages 5585 holes under exactly the same conditions. *Water Hardening at Carbon Tool Steel Heats.*

COMPANY,

California, Agents for the Pacific Coast.

101 DUANE STREET, NEW YORK CITY

MONTREAL



"HOW MANY" IS A CONCLUSIVE

A large number of machines of single manufacture in any one shop is conclusive evidence that the work they turn out is satisfactory — that the machines are satisfactory—and the greater the number the more convincing the evidence.

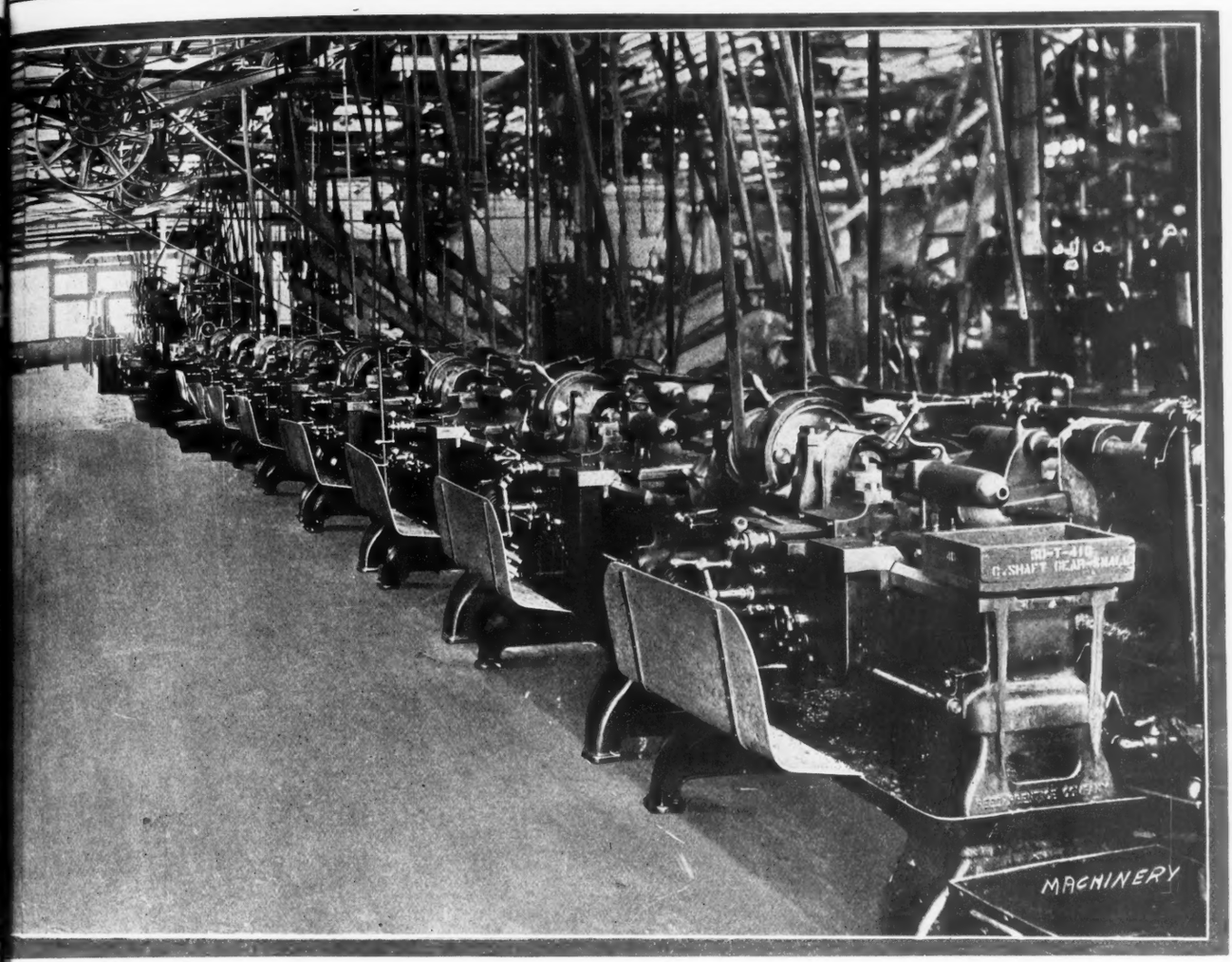
The Ford Company has purchased, and has in use, over 300 *Reed Lathes.* These machines have proven their capacity for wide range production, their accuracy, their economy, their durability under hard service in the hands of unskilled help—else they wouldn't be there.

Hubs, shafts, transmission parts, knuckles, steering gear and axle parts are handled—the range of work in the Ford Plant is as wide as will be found anywhere. The Standard Reed Lathes have been provided with additional equipments and accessories to handle their work most efficiently. In some

F. E. REED COMPANY DEPARTMENT,

Selling Agents: Manning, Maxwell & Moore,

San Francisco, Philadelphia, Cleveland, Chicago, Boston, Mexico City, Detroit, Buffalo, St. Louis, Yokohama, Japan, Pittsburgh



DEMONSTRATION OF "HOW WELL"

cases tailstocks have been removed, special chucks have been fitted and other changes have been made.

It is the *Reed Extra Heavy Plain Turning Lathe* that the Ford people selected—a 14-inch machine with all the strength, rigidity and power of the ordinary 20″ lathe. Let us tell you about the single lever control, powerful friction in head for starting and stopping spindle instantly and other advantages of this Reed Machine.

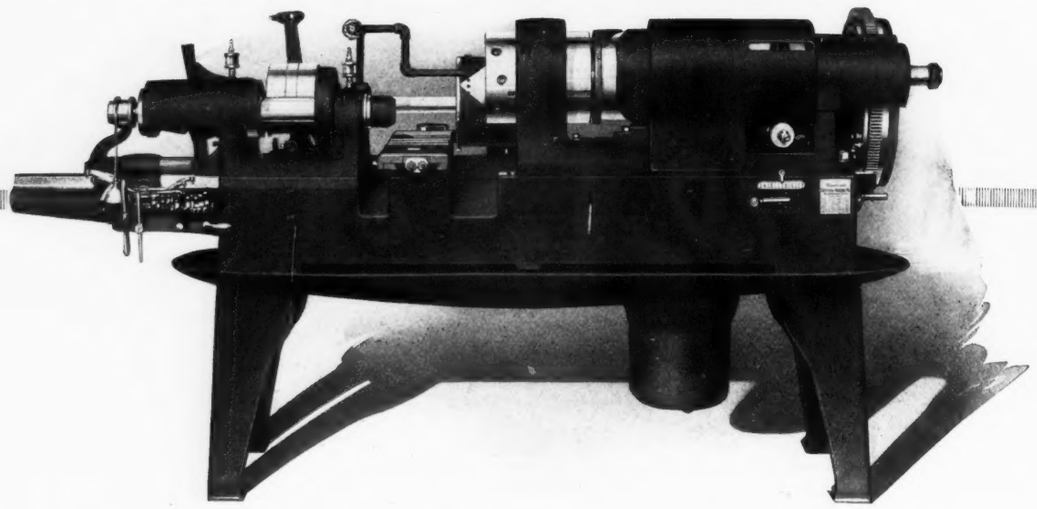
OTHER REED MACHINES:

Standard Engine Lathes — **Heavy Duty Lathes**
Motor Driven Lathes — **Plain Turning Lathes**
Hand Lathes — **Special Lathes**
Manual Training Wood Turning Lathes

REED-PRENTICE CO., Worcester, Mass.

Inc., 85-87-89 Liberty Street, New York City

Thomas & Lowe Machinery Co., Providence, R. I. H. A. Smith Mchy. Co., Syracuse, N. Y. The Chas. A. Strelinger Co., Detroit, Mich. Alexander & Garsed, Charlotte, N. C. Fenwick Freres & Co., Paris, France. Charles Churchill & Co., Ltd., London, England. Van Rietschoten & Houwens, Rotterdam, Holland. Moscow Machine Tool & Engine Co., Moscow, Russia. C. S. J. W. Gardner Co., St. Petersburg, Russia. F. G. Kretschmer & Co., Frankfurt, a/M., Germany. H. W. Petrie, Ltd., Toronto and Montreal, Canada.



CLEVELAND AUTOMATIC

Simple Tooling means Greater Production

Tooling-up a Cleveland Automatic is simple — so simple that we stand ready to prove, at any time and in any company, that no other full turret automatic can be changed from one job to another as rapidly as the "Cleveland." Cams are not removed and replaced by other shapes when changing jobs—simply adjusted on their drums. Nor is expensive cam-cutting necessary — a great saving in actual time and labor is thus accomplished. Simple tooling-up is one point of "Cleveland" superiority which should never be lost sight of when figuring ultimate results and comparing machines.

Another point: the cost of maintenance in a "Cleveland" equipped shop is insignificant. The number of orders we receive for repair parts is less, machine for machine, than for other makes of automatics. We make this statement without fear of contradiction.

The interchangeability of all parts provides another saving, in case of accident, by which "Cleveland" users benefit.

Cleveland Automatics are manufactured in four different designs—Models A, B, C and D—and thirty sizes ranging in capacity from ¼ inch to 7¾ inches. The machine to best meet *your* needs is here.

Ask about it.

CLEVELAND AUTOMATIC MACHINE CO.

CLEVELAND, OHIO, U. S. A.

EASTERN REPRESENTATIVE: J. B. Anderson, 211 Gowan Ave., Mt. Airy, Philadelphia.
WESTERN REPRESENTATIVE: Herbert E. Nunn, 565 West Washington St., Chicago.
FOREIGN REPRESENTATIVES: Chas. Churchill & Co., London, Manchester, Birmingham, Newcastle-on-Tyne and Glasgow. Alfred H. Schutte, Cologne, Brussels, Paris, Milano, Bilbao, Berlin and St. Petersburg, Stockholm and Copenhagen. Donauwerk Ernst Krause & Co., Austria-Hungary and the Balkan States. Andrews & George, P. O. Box 66, 242 Yokohama, Japan.

The Micrometer with the "Built-in" Friction Thimble

Unlike the old type of friction or ratchet stop, the new Slocomb Friction Thimble is an integral part of the micrometer itself, handy, accurate, inconspicuous.

The Thimble is right between the thumb and forefinger on any size work—just where it ought to be if the hand that holds the tool is to operate it also.

It makes the new Slocomb a single-handed micrometer and does away with the vise or other holding devices. It is a "Slocomb" instrument throughout—well made, well finished, easily read, adjustable for wear, with threads and other parts renewable, in short—

"The Longest Lived Micrometer that can be Bought."

New Catalog No. 14M Now Ready

shows the complete "Slocomb" line—Micrometers, Reference Discs, Center Drills, etc. Contains metric conversion tables, speed tables for drilling; shows how to measure three fluted tools with a micrometer and other special uses for these instruments, how to make proper allowances for various classes of fits, etc. Mail the coupon today for your copy. Be sure to put on your complete address.

J. T. SLOCOMB COMPANY

PROVIDENCE, R. I.

Representatives in England, Chas. Churchill & Company, Ltd., London, Birmingham, Manchester, Newcastle-on-Tyne, and Glasgow.

J. T. SLOCOMB CO.,
Providence, R. I.

Please send me copy of your latest Catalogue No. 14 M.

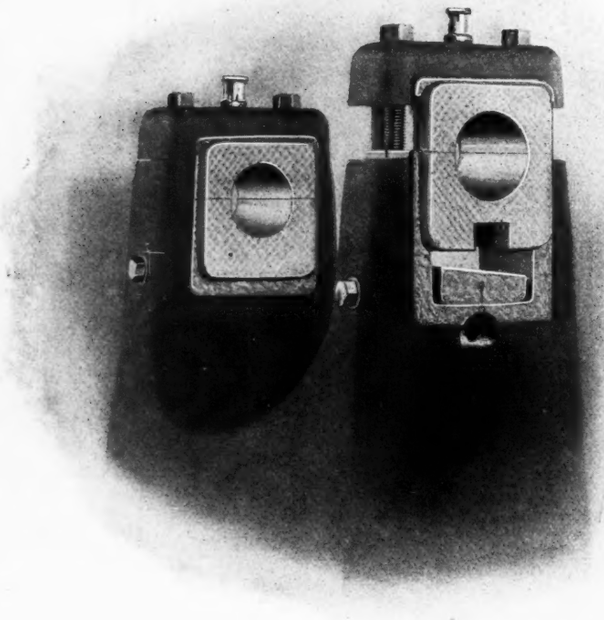
Name .....

Street .....

City .....

Firm .....

Position .....

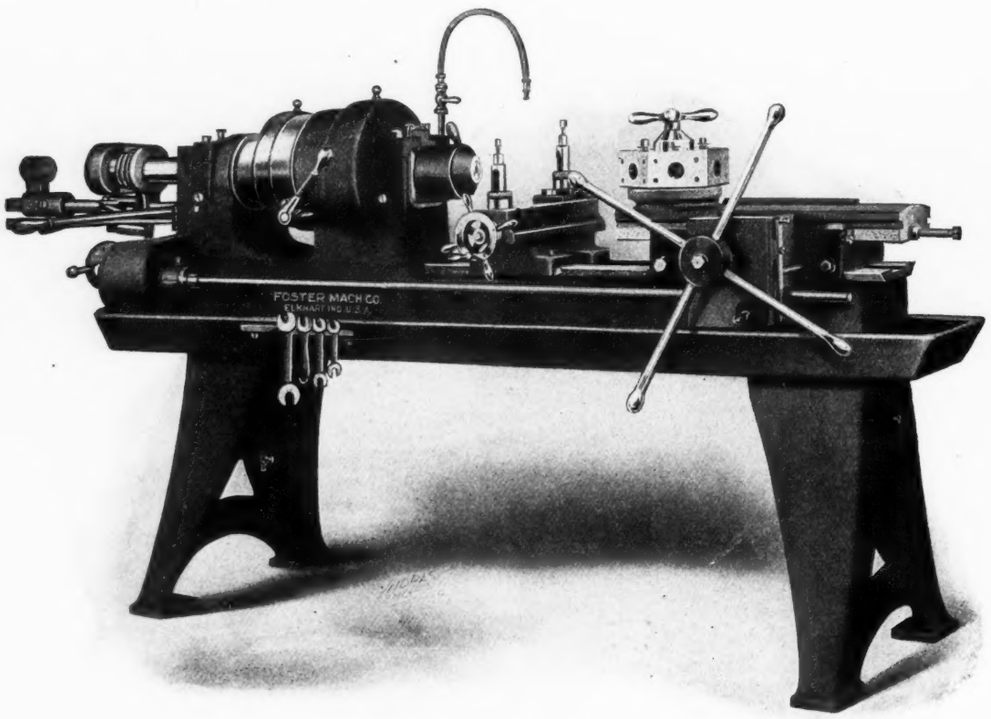


Foster Screw Machines Work Without Waste

Foster Screw Machines cut clean—are accurate and reliable. Foster headstock boxes are made square, with taper wedges at the bottom, placed sidewise for adjusting the spindle. Alignment can be maintained perfectly.

Foster Friction Head Screw Machines have independent stops to each hole in the turret—quick-change gears to power feed, giving four feeds and a power cross feed to cut off if so ordered. Furnished with or without power feed. Handle work up to four inches automatic chuck capacity in either brass or steel.

Our catalogue explains the good points of "Foster" Machines. You'll need a copy.



FOSTER MACHINE COMPANY, Elkhart, Ind., U. S. A.

1100 Beardsley Avenue

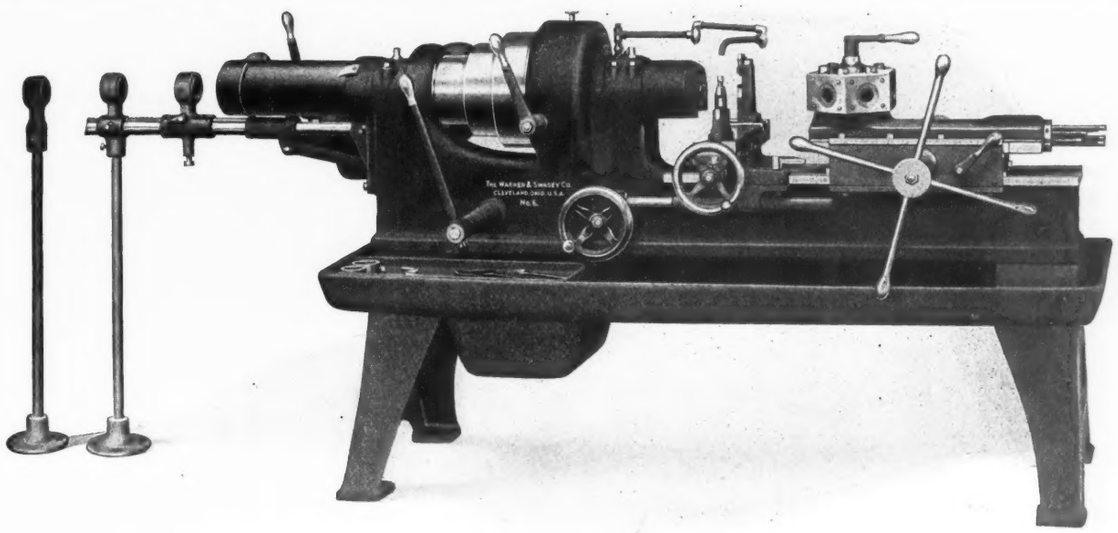
THE WARNER & SWASEY COMPANY

CLEVELAND, OHIO, U. S. A.

NEW YORK OFFICE—Singer Bldg. BOSTON OFFICE—Oliver Bldg. DETROIT OFFICE—Ford Bldg. BUFFALO OFFICE—Iroquois Bldg.
CHICAGO OFFICE AND SHOW ROOMS—618 622 Washington Blvd.

FOREIGN REPRESENTATIVES: Chas. Churchill & Co., London, Birmingham, Manchester, Newcastle-on-Tyne and Glasgow. Alfred H. Schutte, Cologne, Paris, Brussels, Milan, Bilbao and Barcelona. Schuchardt & Schutte, Berlin, Vienna, St. Petersburg, Stockholm, Copenhagen and Budapest. A. Asher Smith, Sydney, Australia. A. R. Williams Machinery Co., Toronto, St. Johns, Winnipeg and Vancouver. Williams & Wilson, Montreal.

UNIVERSAL HOLLOW-HEXAGON TURRET LATHES—TURRET SCREW MACHINES—BRASS-WORKING MACHINE TOOLS



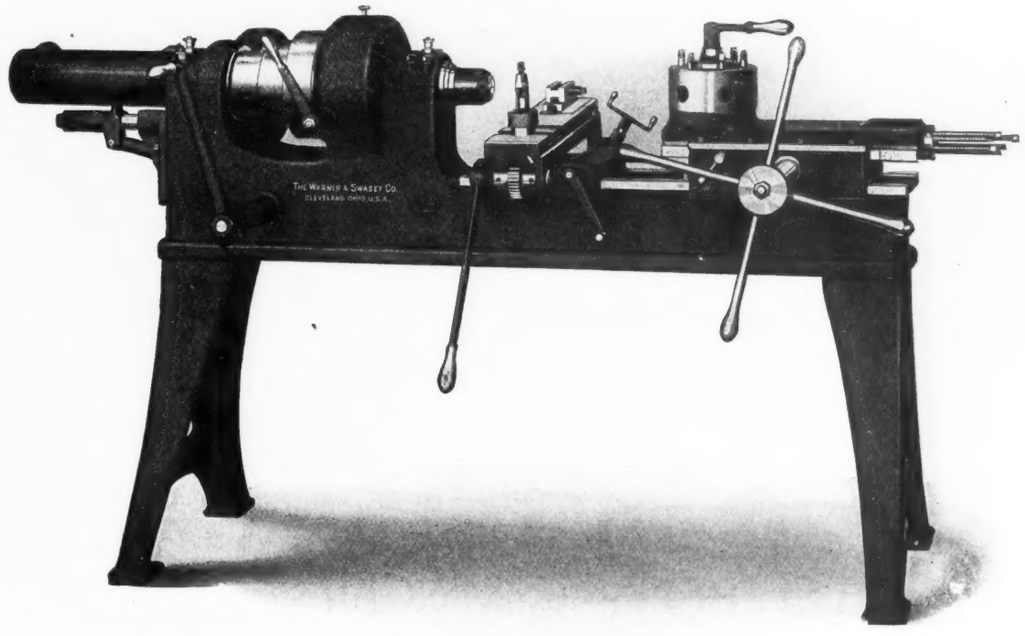
No. 6—2⅛" BAR CAPACITY; 18" SWING

TURRET SCREW MACHINES

Five Sizes—⅝ to 3⅝" Bar Capacity; 10 to 20" Swing

For the most exacting requirements of modern manufacturing methods

Great productive capacity—adaptability and mechanical refinement—the result of thirty years' experience devoted to the highest standard of construction.



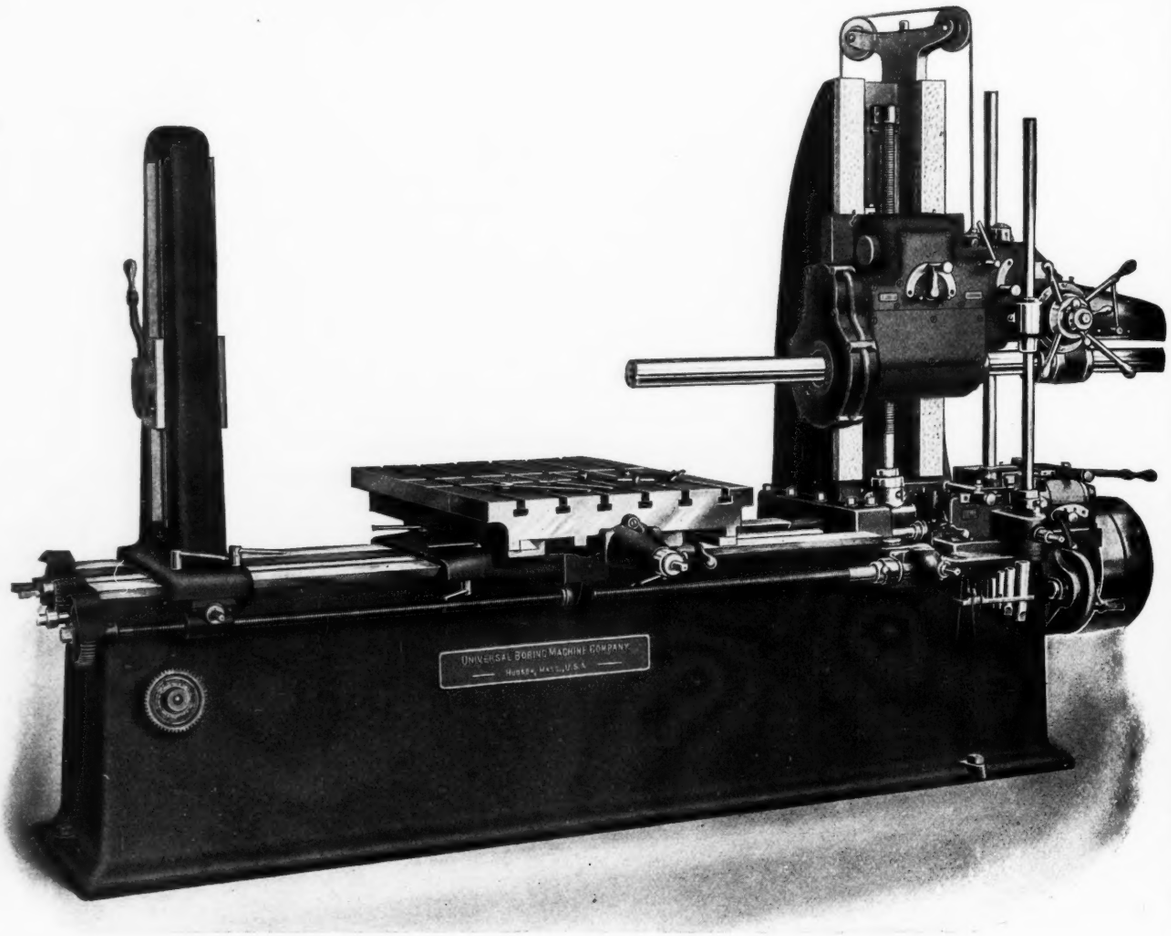
14" FORMING TURRET LATHE

TURRET LATHES—For Brass and Iron Work

Sizes—12 to 24" swing. With Plain, Set-over or Universal Turret. With or without Geared-friction Head, Automatic Chuck, Cut-off, Forming Attachment, Chasing Attachment, Etc.

Universal (Horizontal) Boring Machine

A MACHINE OF THE FINEST ACCURACY



NO. 3 UNIVERSAL (HORIZONTAL) BORING MACHINE.

Automatic continuous feed for boring bar 30" (by once resetting 56"). Automatic vertical feed of the head 30". Width of table 30".

Our Universal (horizontal) Boring Machines can also be called Universal (horizontal) Milling Machines, as in a great many shops our machines are being used even more for milling than for boring or drilling.

Our machines are also highly recommended for work where extreme accuracy is desired, such as machine tool building, and for jig drilling and boring.

UNIVERSAL BORING MACHINE COMPANY

HUDSON, MASSACHUSETTS, U. S. A.

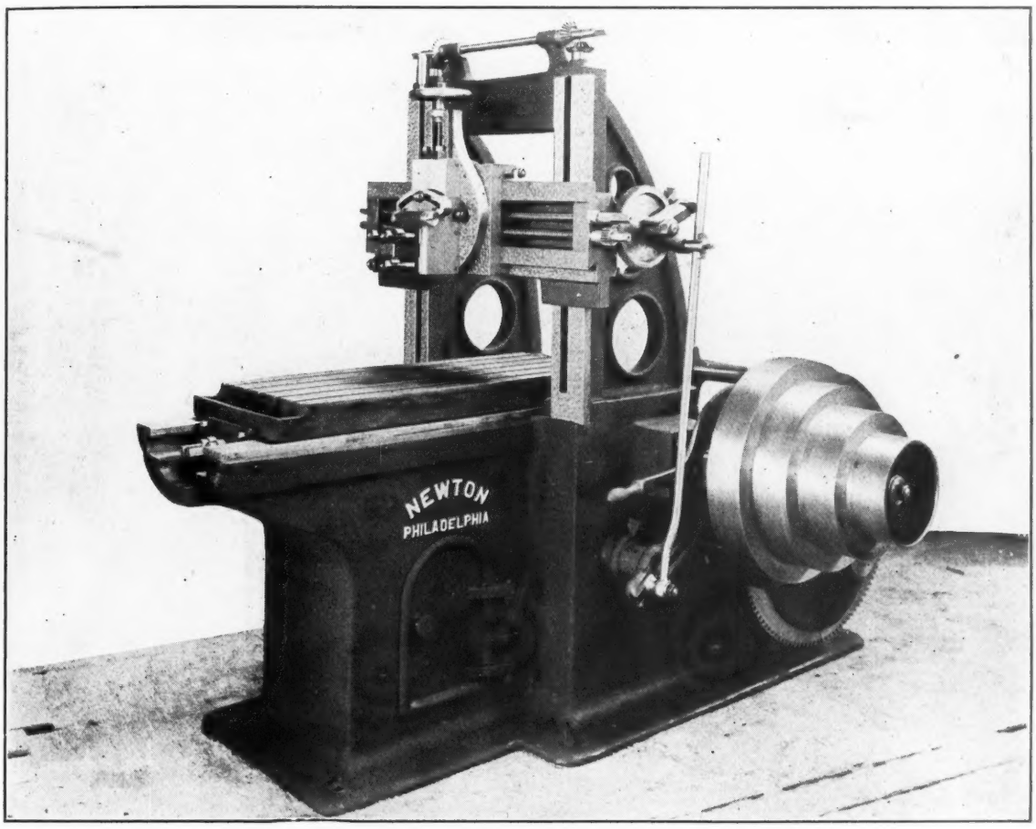
SELLING AGENTS: Hill, Clarke & Co., Boston, New York, Chicago. Brown & Zortman Machinery Co., Pittsburgh, Pa. Harron, Rickard & McCone, San Francisco, Cal. The Chas. A. Strelinger Co., Detroit, Mich. Aumen Machinery Co., Baltimore, Md.
FOREIGN AGENTS: Alfred Herbert, Ltd., Coventry, England. Alfred Herbert (France), Ltd., Paris. Heinrich Dreyer, Berlin. R. S. Stokvis & Fils, Brussels.

NEWTON

(REGISTERED TRADE MARK)

Builders of Machine Tools for Foundries, Forges, Structural and General Manufacturing, and Locomotive Shops, Electrical Works and Shipyards.

Cold Metal Saws Slotting Machines Boring, Milling Machines
Rotary Planing Machines Keyseating Machines
Rail Ending and Rail Drilling Machines, etc., etc.



NEW DESIGN CRANK PLANING MACHINE

SIZES

20″ x 20″ x 20″ stroke.
24″ x 24″ x 24″ stroke.
30″ x 30″ x 30″ stroke.

Newton Crank Planing Machines are furnished with turret tool post and angle fixtures when desired.

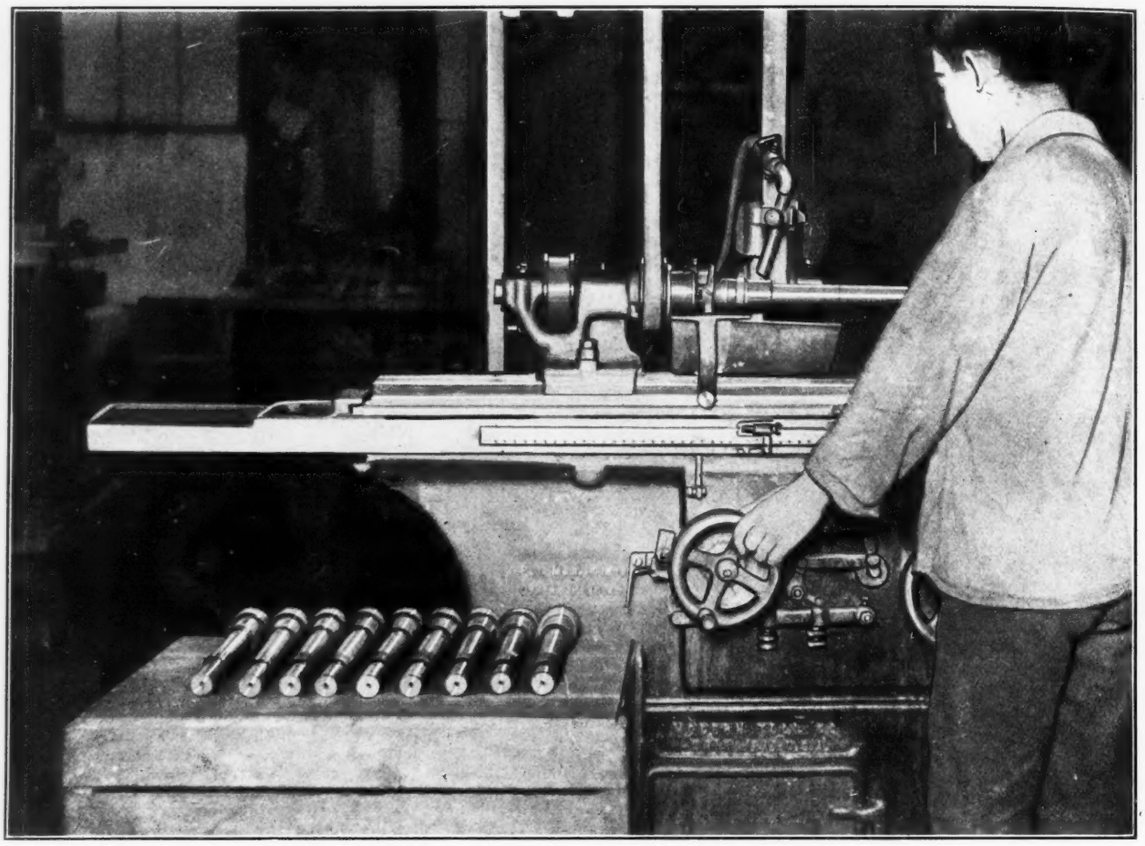
The design embodies correct mechanical construction, with convenient control. Table has square lock bearings, table adjusting screw is relieved of strain under cut, tool block has vertical, angular and horizontal feeds operating at end of stroke, and cone is controlled by a hand brake. Driven through Witworth motion giving quick return.

Newton Machine Tool Works, Inc.

Philadelphia, U. S. A.

FOREIGN REPRESENTATIVES: Berlin, Heinrich Dreyer. Vienna, Rudolf Salzer. Italy, Spain, Switzerland, Belgium and France, Fenwick Freres & Co., Paris. Williams & Wilson, Montreal. M. Buarque, Rio de Janeiro, Brazil. Australia, Benson Bros., Sydney, Melbourne, Adelaide and Perth.

The "Modern" Method of Grinding Lathe Spindles Assures Accuracy



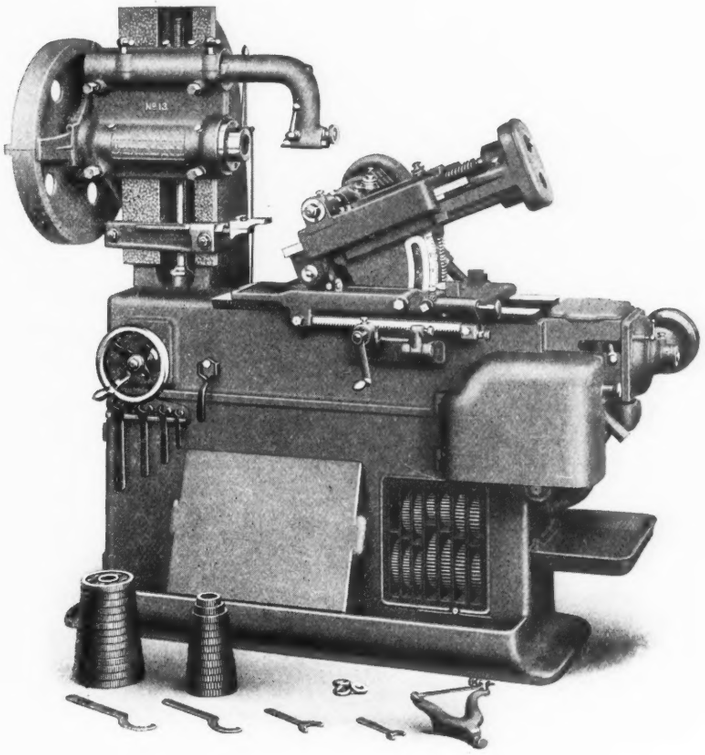
The Hjorth Lathe and Tool Company of Woburn, Mass., recognize the good qualities of "Modern" Grinding Machines for grinding the spindles of their Hjorth Bench Lathes. They have used a "Modern" Grinder for two years with entire satisfaction and pronounce it a complete success.

Modern Grinding Machines have an all geared headstock—any speed without shifting a belt; also a Table Reversing Mechanism, without a load or fire spring, that positively reverses each trip and is non-self-centering; and other exclusive advantages which make them receive entirely favorable comment from manufacturers everywhere.

When you write for catalogue ask about our new No. 18 Plain Grinding Machine.

MODERN TOOL COMPANY, Second and State Streets ERIE, PENNSYLVANIA

BOTH SPUR AND BEVEL GEARS CUT ON THE SAME MACHINE



No. 13 Automatic Gear Cutting Machine

Is your production of bevel gears too small to keep a machine busy all the time?

Here is a machine that will cut both spur and bevel gears with equal efficiency.

The handiness of operation and rapid production of the automatic spur gear cutting machine is applied to bevel gear cutting, making this machine of particular advantage not only to the shop with a small quantity of both spur and bevel gears, but to the big manufacturer looking for rapid production of bevel gears only.

Cutter can be set either side of center for cutting bevels, a vernier reading to thousandths of an inch indicating the adjustment.

Cutter carriage is adjustable to any angle from 0 to 90 degrees, with a graduated arc indicating the elevation.

Operator has full control from the front of the machine.

Capacity: Spur and bevel gears to 18" diameter, 4" face.

These are a few of the advantages. Ask us about the others.

BROWN & SHARPE MFG. CO.

PROVIDENCE, R. I., U. S. A.

Read pages 83 A—83 B

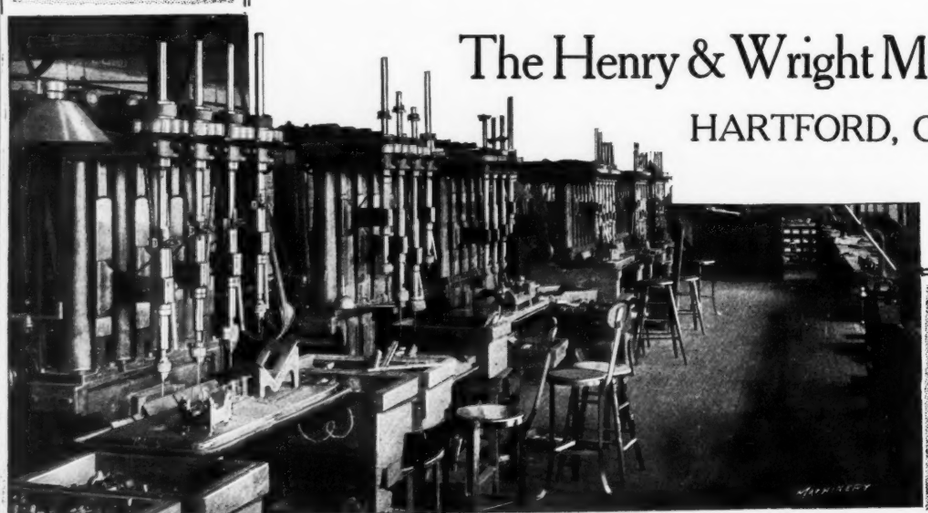
Drilling Department in a Modern Metal Working Plant

Modern Drilling Methods and Henry & Wright Ball Bearing Drilling Machines

are bracketed together in the minds of most manufacturers. In the plant where up-to-date equipment is the order, where economy in production is most carefully studied, where high grade work is essential, you will find Henry & Wright Drilling Machines. The views shown are from photographs taken in one of the representative plants of New England—a shop where the Henry & Wright machines are almost exclusively used in the Drilling Departments—used because of their ability to produce the finest work, to reach highest speeds, to stand hard, continuous service, and to give full return for the power employed.

These qualities have always been characteristic of Henry & Wright Drilling Machines, but in the later models they are accentuated and made even more positive. Our small booklet entitled "Classes B and C Drilling Machines" describes the latest improvements—let us mail a copy.

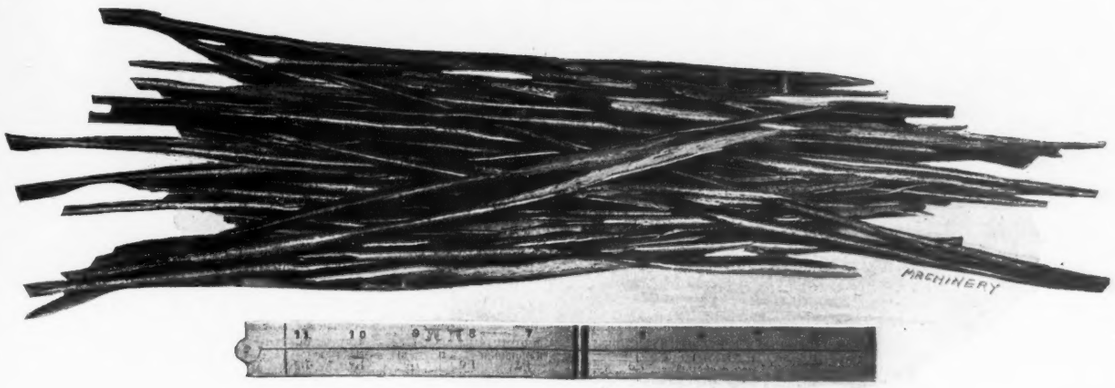
All H & W Ball Bearing Drilling Machines



The Henry & Wright Mfg. Co.

HARTFORD, CONN.

Another View in the same Factory



You Will Be Interested in These Chips

¶ They are 18″ long made with a Taylor-Newbold High Speed Milling Cutter working at a depth of one-half inch at high speed in the Newton Machine Tool Works.

There are three reasons for this ability of these cutters to stand up under this excessive duty at high speeds and fast feed.

First. Taylor-Newbold cutters have inserted blades that are separately treated by the improved Taylor-White process. This cannot be done with solid high speed steel cutters owing to the danger of cracking or warping the body of the cutter.

Second. A continuous cutting angle is maintained throughout the life of the blades, making it possible to maintain a heavy feed.

Third. A broken blade may always be replaced at small cost.

If you do milling *and want maximum output*, fill out coupon below and we will send you catalogue and full details how to get same at minimum cost.

COUPON

THE TABOR MFG. COMPANY
18th and Hamilton Sts., Philadelphia, Pa.

Please send catalogue and full details how I can save money in our milling department.

Signed .....

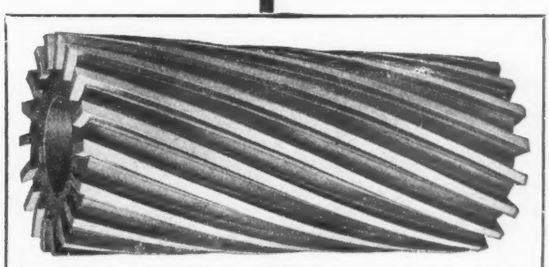
Firm .....

Position .....

The Tabor Mfg. Company

18th and Hamilton Streets

PHILADELPHIA, PA., U. S. A.

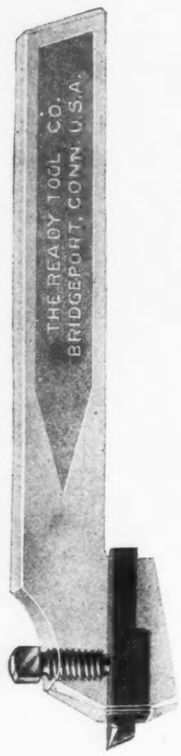


"The Cutter and the Chips"

See Other Side

Smooth Planing For You Without Chatter

With the New Red-E Shaper and Planer Tool

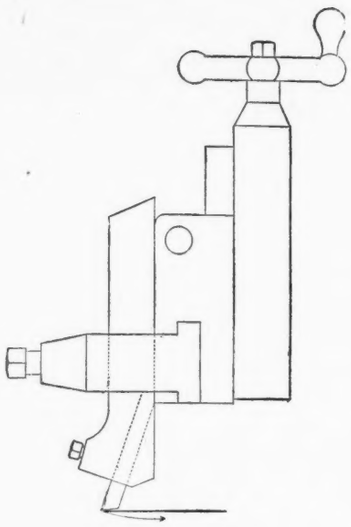


Compare the two diagrams—note the ADVANTAGES of the new RED-E Style "K" Shaper and Planer Tool. The cutting point is on the line of deflection and any springing of the tool takes it away from the work and not into it deeper. No chatter or rough cutting as when using a *lathe* tool in a shaper; does just the work that the old "goose neck" forged tool used to do without the necessary forging, tool dressing, grinding and heat treating.

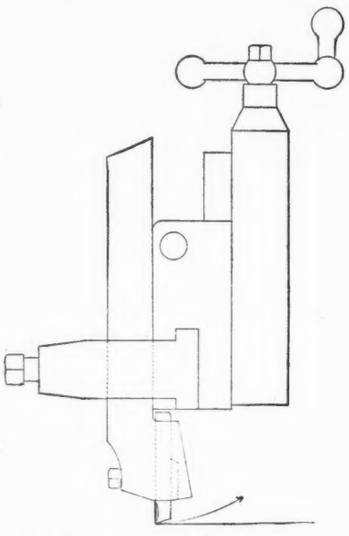
This tool is a drop forging of Chrome Nickel Steel with a tool steel bearing to take the cutting pressure. Furnished with the highest grade high-speed steel cutter, treated with the Taylor-White process. This means DOUBLE the work with HALF the usual sharpening.

Try out this new planer tool. See if it doesn't take heavier cuts, stand up longer between grindings and make a saving in your tool expense account.

Send for our new booklet "The Vital Factor in Cutting." It contains an interesting treatise on the proper cutting contour and angles for rough turning tools, the correct heat treatment of high-speed steel and a practical table of feeds and speeds for rough turning iron and steel, and also incorporating our complete new RED-E catalogue. Fill out coupon and mail *today!*



Lathe Tool Used for Planing



Red-E Style K Shaper and Planer Tool
(PATENTED)

THE READY TOOL CO., 654 Main St., Bridgeport, Conn.

The Ready Tool Co., Bridgeport, Conn.

Send without cost to me your new booklet "The Vital Factor in Cutting."

Signed.....Position.....

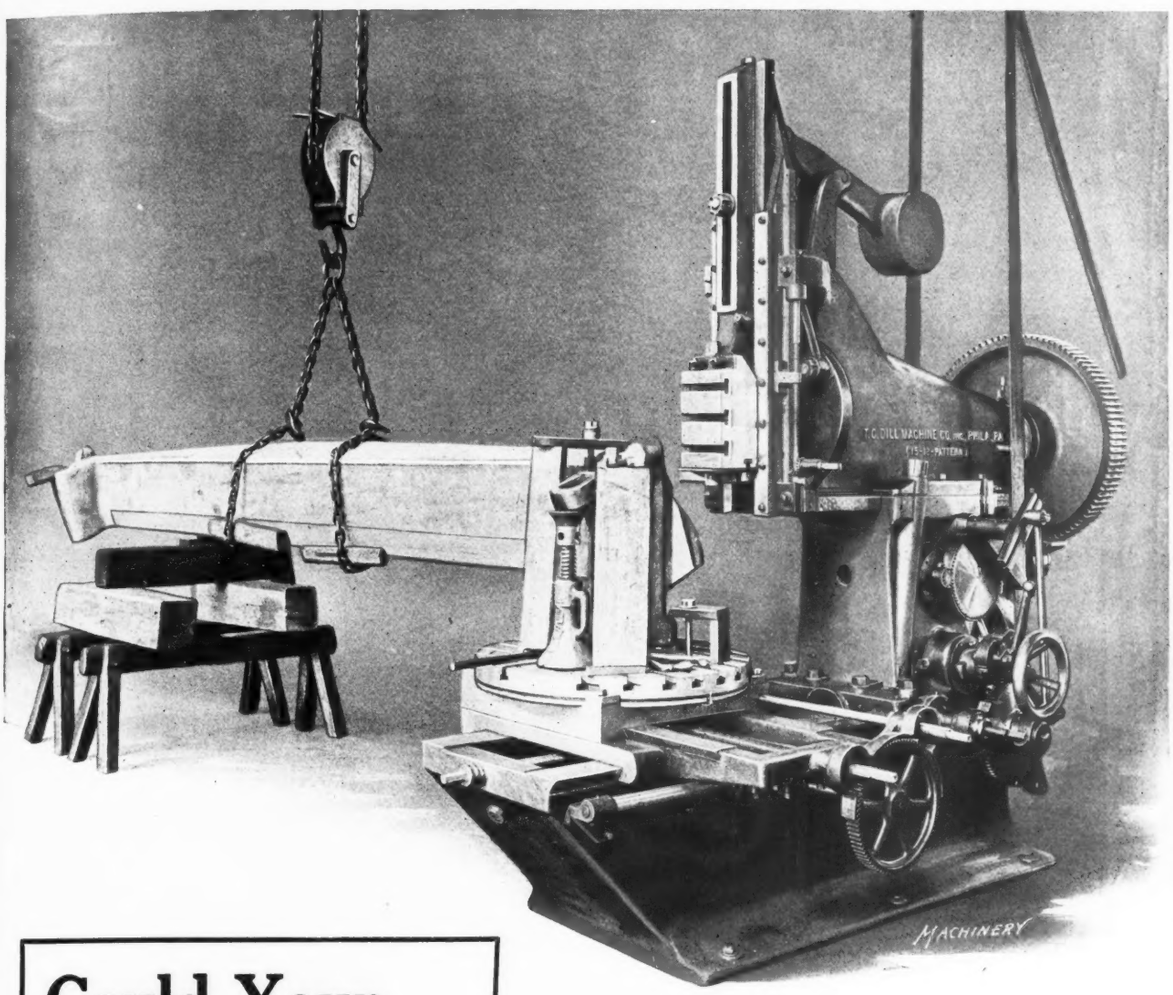
Firm.....

Supt.....

M. M.....

F. T. R.....

(READ OTHER SIDE.)



Could Your Shop Handle This Job ?

It's one of those long awkward jobs with a small amount of machining on each end—the finishing of the guides in a large shear blade.

It's the kind of piece which doesn't lend itself to clamping very securely—a piece you would hardly care to handle by planing, but the Dill Slotter fits in just right because the casting can be mounted in a fixed position, just as you see it, and finished by means of the traveling head. After it is once located, the work need not be removed. All adjustments and all feeds can be made from the cutting head.

Dill Slotters have long stood for the best in slotting. Every improvement and convenience making for efficiency has been incorporated in this design.

Quick traverse gear is provided for moving the head and compound table in all directions quickly by power. This is a great advantage in setting up work.

The **quick return**, which is a boomerang to crank slotters when working at high cutting speeds, is arranged on the "Dill" so that the quick part of the return movement takes place at the lower end of the stroke, where there is always a successive dwell. This feature alone, under equal conditions, gains one stroke in ten over competitive slotters.

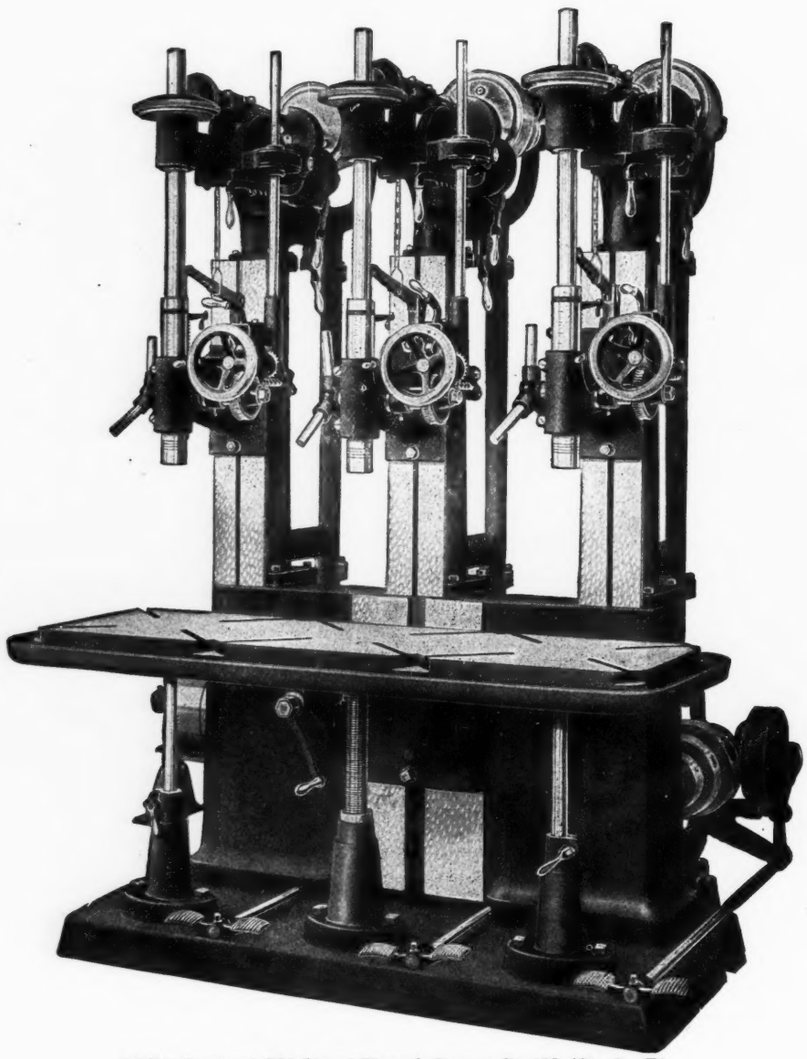
There are other points in the Dill Catalogue which will interest you—may we send you a copy?

THE DILL SLOTTER PEOPLE, Kensington, Philadelphia

AGENTS FOR GERMANY AND AUSTRIA:
Heinrich Dreyer, Berlin, Germany, Belgium and France; Stokvis & Zonen, Ltd., Rotterdam and Brussels.

The BARNES

Some auto factories are equipped with one of our Gang Drills



Others have from 2 to 8 of the various styles and sizes in use

22½" Swing Sliding Head Gang Drill (Style B).

The two gangs illustrated herewith are only two of the various size and style gang drills we make, and we think it would be to our mutual interest if you would write us for our drill catalogue, which covers our line of gang drills, upright drills, and one or two other machines which are of interest to the auto trade.

For instance, we make a 20-inch gang drill which can be equipped with automatic approach and return feed to the spindle and is known as style "A." We also can furnish our 20-inch Gang Drill, style "B," which has self-feed and automatic stop in combination with plain lever feed and worm feed. We also can furnish our 20-inch Gang Drill, known as style "C" or "D," which gangs do not have the single table and box column, but are equipped with individual tables and individual columns; likewise, on the larger size gang drills, we can furnish either the box column and single long table or individual columns and table.

You will note our standard countershaft is driven by one tight and loose pulley and yet all spindles can be run together or separately. If the customer prefers, we can furnish a tight and loose pulley for each spindle, though we believe that our standard countershaft is far more practical.

We make a 26-inch Swing Sliding Head Gang Drill, and also a 22½-inch Swing Stationary Head Heavy Duty Gang Drill, which will take care of holes up to 2 inches in diameter in solid steel.

Please take note that the gang drill is not only adapted for drilling, but also for reaming and facing; combination tools and box mills can be used to good advantage on the different spindles. Also note our tapping attachment can be furnished on the spindles of the gang drill.

If you do not have one of these gang drills in use at the present writing, we are confident that it will prove to our mutual interest for you to look into the matter. We shall be very glad indeed to send you our catalogue. We would like information as to the material and the size holes that you would consider drilling on the gang drill.

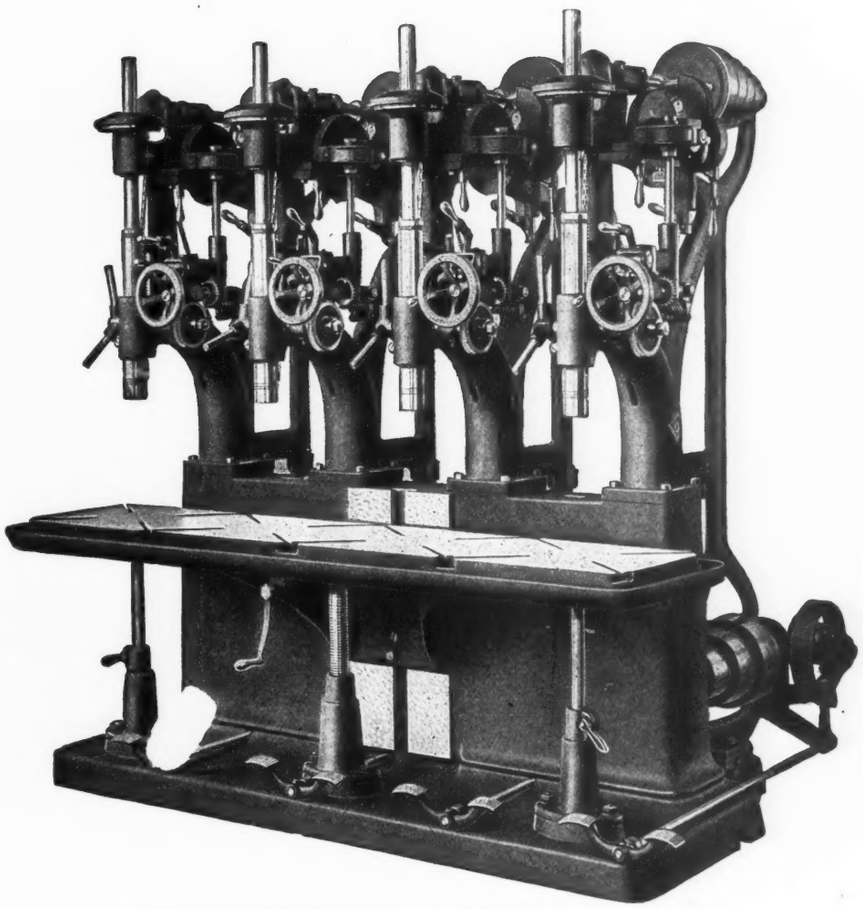
W. F. & JOHN BARNES COMPANY

FOREIGN AGENTS—Fenwick Freres & Co., Paris. Heinrich Dreyer, Berlin

GANG DRILLS

TRADE W.F. J.C. B MARK

We make various sizes, drilling holes up to 2" diameter in solid steel



4 3 or 2 Spindles

22" Swing Stationary Head Gang Drill (Style B).

LOOK HERE!

This Gang Drill Has

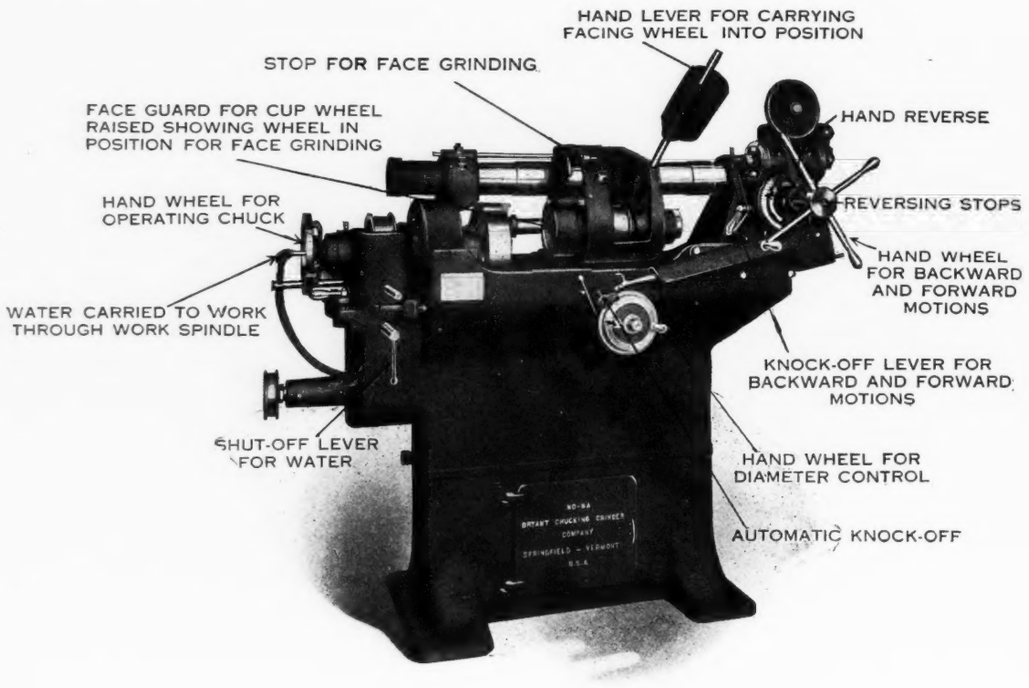
- Spindle travel of 14¾ inches.
- Table travel of 14½ inches.
- Distance from column to spindles 11½ inches.
- Distance between spindles 20 inches.
- A 4-spindle gang weighs 5800 lbs.
- Table measures 17x80 inches on 4-spindle gang.

This Gang Drill has driving capacity of a 26-inch swing drill; is equipped with back-gears, self-feed and automatic stop. **Our Geared Tapping Attachment** can be furnished on one or more spindles. Machine is driven by one main driving belt, and yet each spindle can be run separately, or all spindles at one time. We also make other sizes of Gang Drills and complete line of Upright Drills.

231 Ruby Street, Rockford, Ill., U.S.A.

Chas. Churchill & Co., London. F. W. Horne, Yokohama.

Bryant Grinding Machines are Fast Grinders


HAND LEVER FOR CARRYING FACING WHEEL INTO POSITION
STOP FOR FACE GRINDING
FACE GUARD FOR CUP WHEEL RAISED SHOWING WHEEL IN POSITION FOR FACE GRINDING
HAND REVERSE
HAND WHEEL FOR OPERATING CHUCK
REVERSING STOPS
HAND WHEEL FOR BACKWARD AND FORWARD MOTIONS
WATER CARRIED TO WORK THROUGH WORK SPINDLE
KNOCK-OFF LEVER FOR BACKWARD AND FORWARD MOTIONS
SHUT-OFF LEVER FOR WATER
HAND WHEEL FOR DIAMETER CONTROL
AUTOMATIC KNOCK-OFF

Bryant Grinders are sold on a basis of production.

We can lower the cost of your hole and face grinding and at the same time give you as good or a better finished product.

We make this broad statement rather positively because experience has shown that BRYANT Grinders will surely do this.

Ask to have our representative call and look over your work.

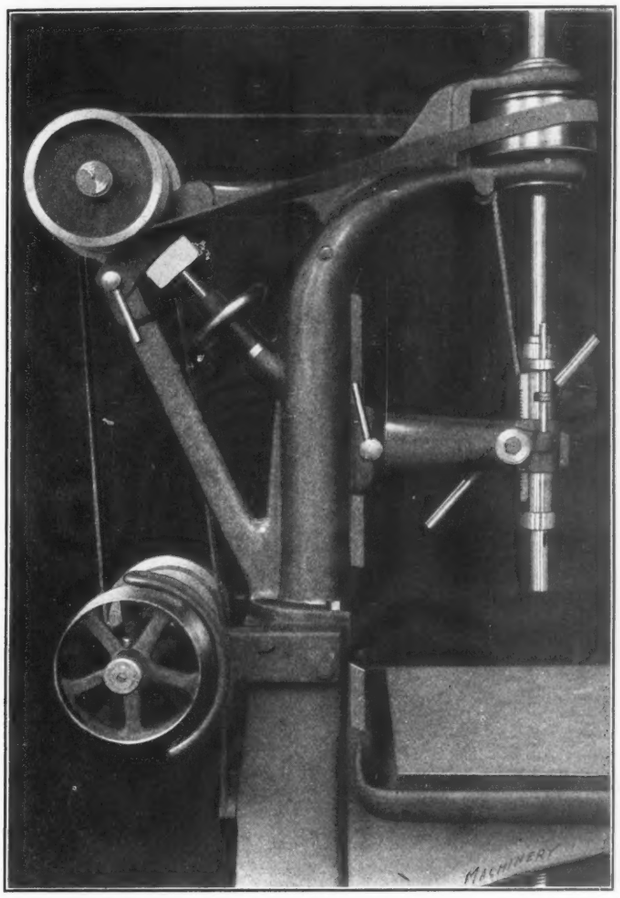
Bryant Chucking Grinder Company

SPRINGFIELD, VERMONT, U. S. A.

EUROPEAN AGENTS: Germany, Holland, Belgium, Switzerland, Italy and Austria-Hungary: M. Koyemann, Charlottenstrasse 112, Dusseldorf, Germany. Great Britain: James R. Kelly & Co., Ltd., 3 and 5 Bridge End, Leeds Bridge, Leeds, England. Russia: Schuchardt & Schutte, St. Petersburg, Russia.

"Built for Service"

SENSIBLE SENSITIVE DRILLS



Strong Efficient Machines

They Give Maximum Service Under Most Severe Conditions

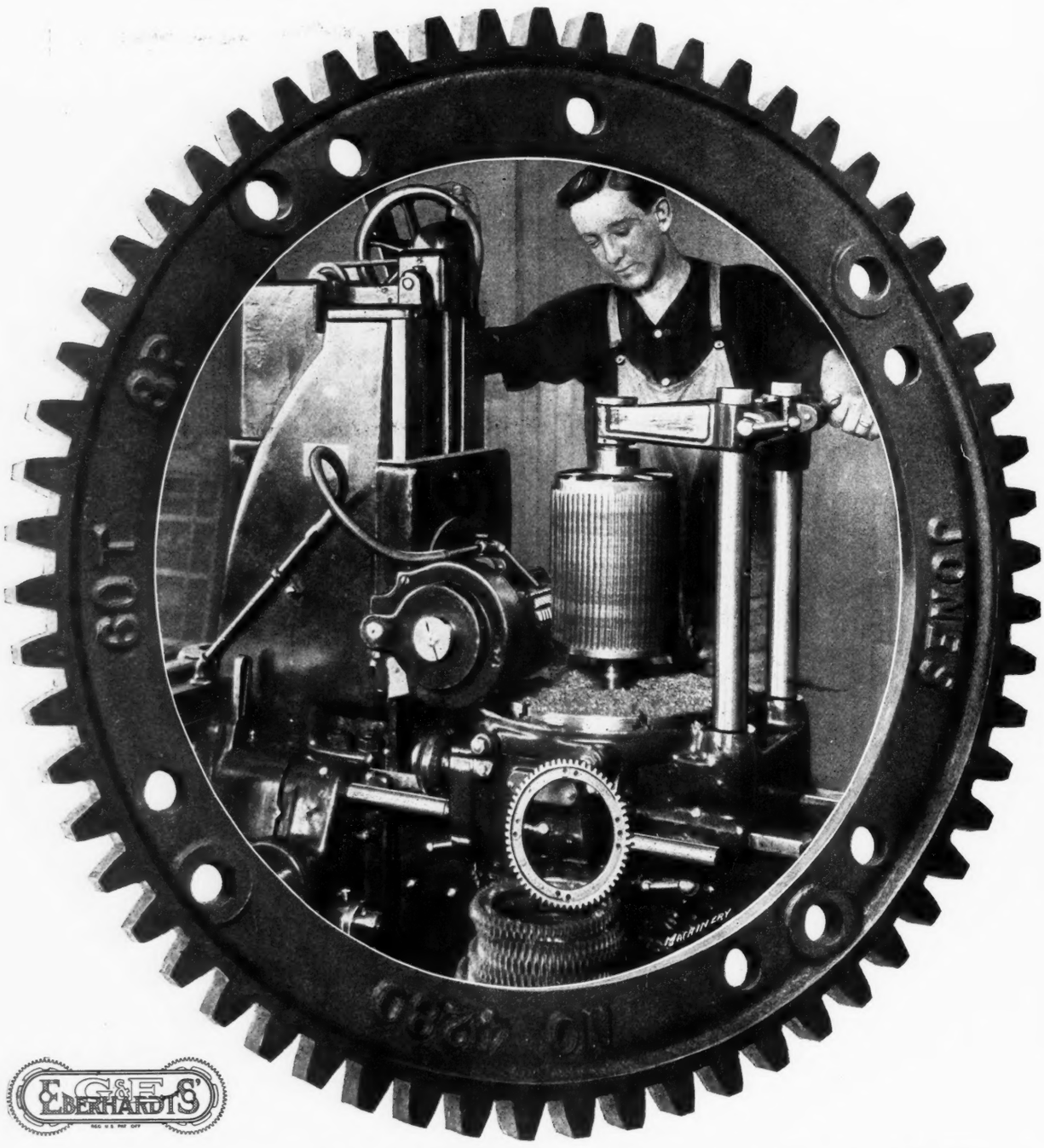
Long life is assured by "sensible sensitiveness" in Leland Drills. Notice the belt tightening feature. A turn of the hand brings both belts to any tension up to breaking strength. This sensitive control avoids wear on bearings due to unnecessarily tight belts. Adjust as required; it is easy with this sensible belt tightener.

There are other distinctive features in Leland Drills. Send for Circular "R" and become familiar with our complete line. Built with 1, 2, 3, 4 and 6 spindles.

W. H. LELAND & COMPANY
WORCESTER MASS., U. S. A.

This Gear—Actual Size

Malleable Iron Gear—7¾" Diameter—⅜" Face



E. & E. EBERHARDTS

GOULD & EBERHARDT

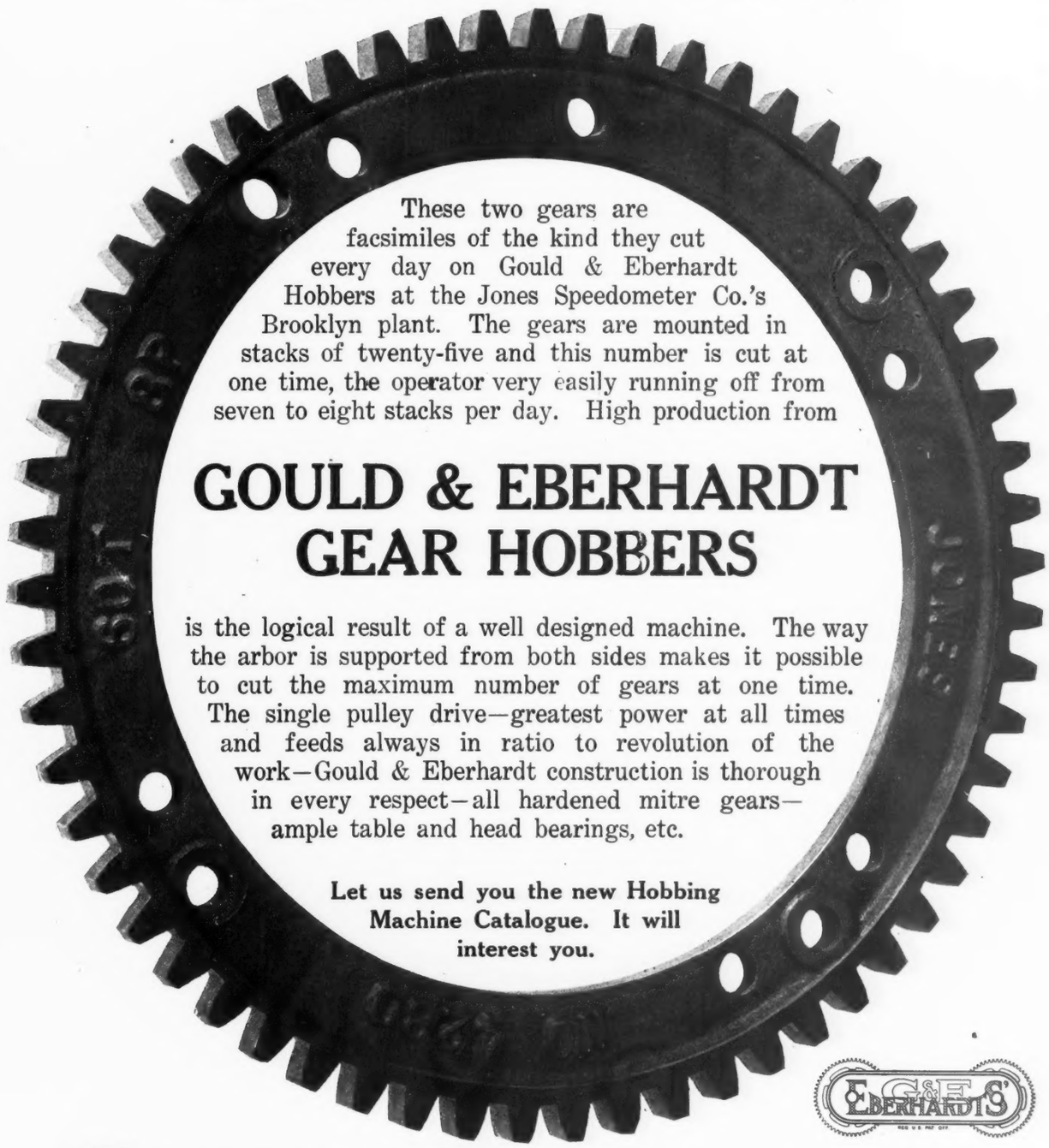
"HIGH DUTY" SHAPERS
AUTOMATIC GEAR AND RACK CUTTING MACHINERY

ESTABLISHED 1833 NEWARK, N.J. U.S.A.

DOMESTIC AGENTS: Prentiss Tool & Supply Co., New York, Boston, Buffalo, Syracuse, Rochester and Scranton. Marshall & Huschart Mchy. Co., Chicago, Indainapolis, St. Louis and Milwaukee. Motch & Merryweather Mchy. Co., Cleveland, Pittsburgh, Detroit and Cincinnati. W. E. Shipley Mchy. Co., Philadelphia. Kemp Machinery Co., Baltimore and Richmond. Hallidie Mchy. Co., Seattle. Hallidie Co., Spokane. Portland Mchy. Co., Portland,

—Cut in Three Minutes

Average Production Rate—180 Per Day



These two gears are facsimiles of the kind they cut every day on Gould & Eberhardt Hobbers at the Jones Speedometer Co.'s Brooklyn plant. The gears are mounted in stacks of twenty-five and this number is cut at one time, the operator very easily running off from seven to eight stacks per day. High production from

GOULD & EBERHARDT GEAR HOBBERS

is the logical result of a well designed machine. The way the arbor is supported from both sides makes it possible to cut the maximum number of gears at one time. The single pulley drive—greatest power at all times and feeds always in ratio to revolution of the work—Gould & Eberhardt construction is thorough in every respect—all hardened mitre gears—ample table and head bearings, etc.

Let us send you the new Hobbing Machine Catalogue. It will interest you.

G&E

GOULD & EBERHARDT

"HIGH DUTY" SHAPERS
AUTOMATIC GEAR AND RACK CUTTING MACHINERY

ESTABLISHED 1833 NEWARK, N.J. U.S.A.

Orc. Dewstoe Machine Tool Co., Birmingham, Ala. Robinson, Cary & SandsCo., St. Paul and Duluth, Minn. Rix Compressed Air & Drill Co., San Francisco and Los Angeles, Cal.
FOREIGN AGENTS: C. W. Burton, Griffiths & Co., London, England. R. S. Stokvis & Zonen, Ltd., Brussels, Rotterdam and Paris. Heinrich Dreyer, Berlin. D. Drury & Co., Johannesburg, South Africa. The A. R. Williams Mchy. Co., Canada. F. W. Horne, Tokio, Japan.

Boring Condenser Castings on the Detrick & Harvey

We built this large Floor Boring Machine for the C. H. Wheeler Manufacturing Company, Philadelphia, Pa., to bore and mill condenser castings and other large work which this concern produces. The requirements called for a machine of extremely large range which could be handled with the utmost convenience.

If you have large boring to do you will be interested in our catalogue.

The casting under operation illustrates these points. Part of the milling is the facing of four supporting lugs by which the condenser is mounted. These spots are at four extreme corners of the casting, but without moving from his position the operator can face them off successively, moving the spindle in any direction. For this particular job the saddle must be raised above the work when milling lugs in front, and the column is moved in alignment with the two lugs on the opposite side. All of these movements are under the control of the operator.

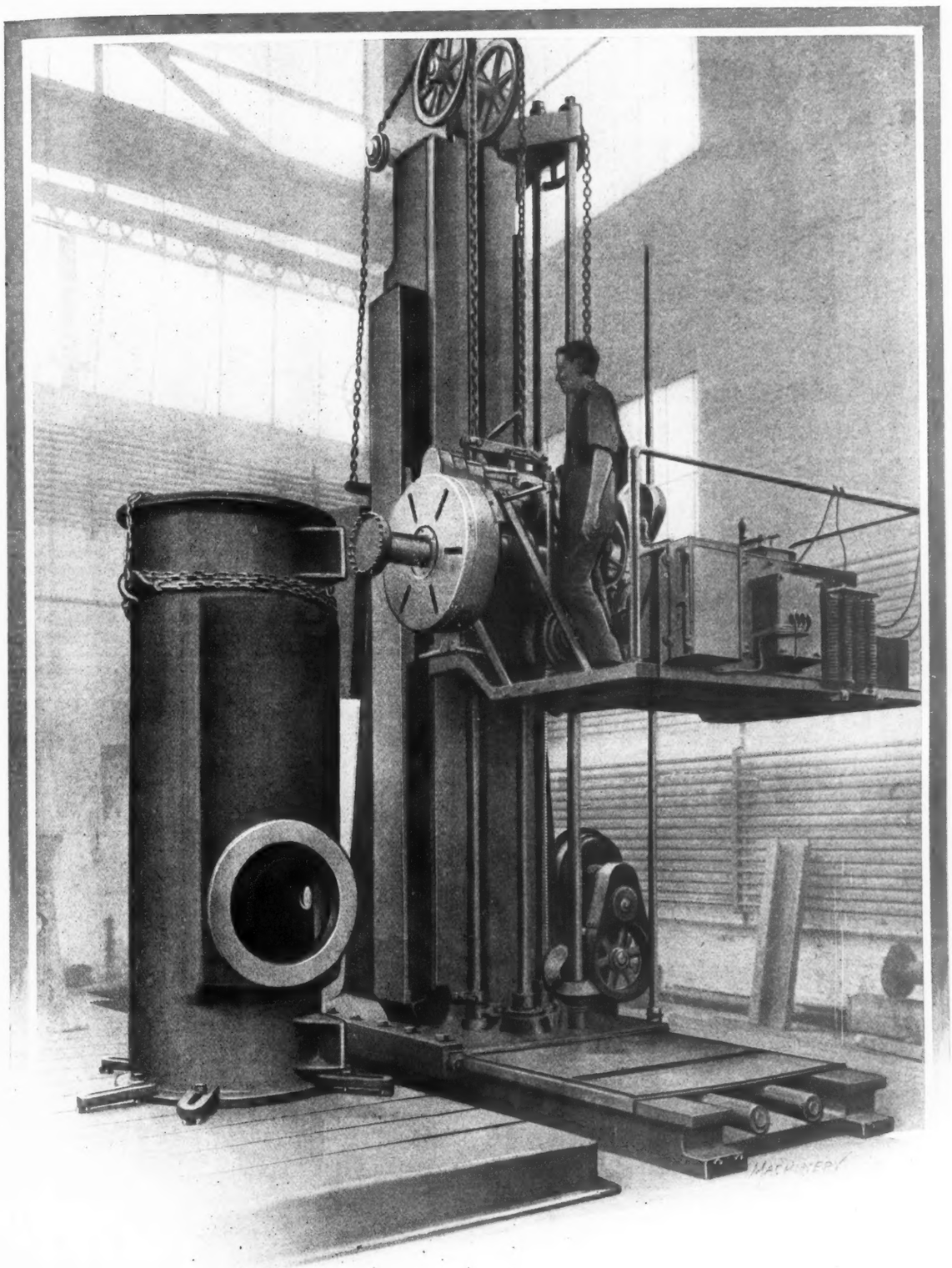
Driving and feeding mechanisms throughout the machine are positively driven by gearing. No belts are employed. All feeds are controlled from the spindle and are in direct ratio to the revolution of the spindle.

With the Detrick & Harvey Floor Boring Machine you can handle a larger variety of work than with any other machine in its class. The boring limit of Detrick & Harvey Machines is the piece of work you can get on the floor plate.

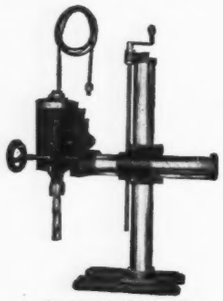
Detrick & Harvey Machine Co.

Baltimore, Maryland, U. S. A.

Planers
Boring Mills



Hand or Breast Drills,
12 sizes, ¼ to 2½" capacities.
Weight from 7 lbs. up.
Screw-feed with large sizes.



Scotch Radial Drill.
Six sizes, ⅞" to 2½" capacities in steel. Drill at any angle in any direction. Two speeds. Motor detachable.

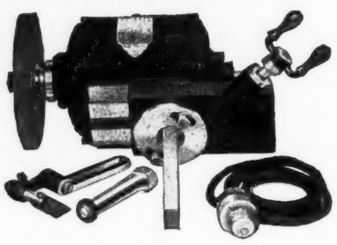
Unlimited Possibilities

There are so many jobs that can be done by *Cincinnati Electrical Tools* that their production possibilities are practically unlimited. They handle drilling and grinding in the various forms required and reaming up to 1" capacity. No tools could be better adapted for the work.

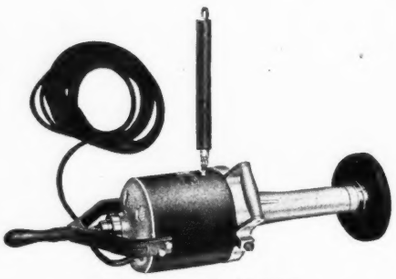
Sent on Trial

Either direct or alternating currents furnished, and Direct-Alternating Drills, used on either current.

Send for No. 4 catalogue.



Tool Post Grinders, ¼ to 3 H. P.
Weight from 16 lbs. up.
Different types for all purposes.



Hand and Aerial Grinders.
For cleaning castings of any kind. Made in four sizes, ¼ to 2 H. P. Weight from 18 lbs. up. End, side or adjustable body handle furnished as desired. Guaranteed for hard usage.

Cincinnati Electrical Tool Co.
649-651 Evans St.
CINCINNATI, OHIO

CINCINNATI PORTABLE ELECTRICS
Drills-Grinders Reamers

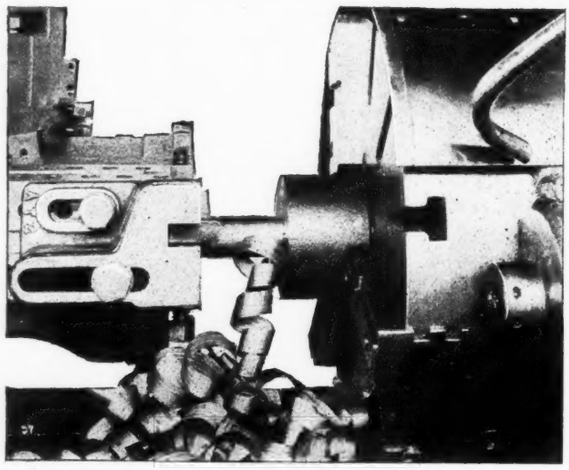
CARRIED IN STOCK:
New York Office: 50 Church St.
Chicago: H. Channon Co.
Cleveland: Strong, Carlisle & Hammond Co.
Pittsburgh: Somers, Fitler & Todd Co.
Baltimore: Kemp Machinery Co.
San Francisco: Fred Ward & Son
Japan: Takata & Co.

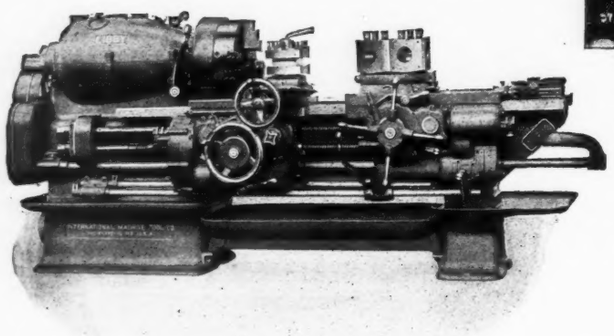
"LIBBY" LATHES are POWERFUL!

See this 18" Lathe reducing a 5" steel bar to 1½" diameter *at one cut*, using 1/96th feed.

This is not a test, but a standard manufacturing operation day in and day out.

This shows the job interrupted in the midst of the cut. The powerful headstock picks up this





cut instantly and surely, *under feed* after stoppage at any time.

And yet it is far from being cumbersome and unwieldy. It is wonderfully handy, and encourages the workman to push it to the limit.

It is a great tool for rapid production.

Get our new book on samples of work done on it in actual practice.

INTERNATIONAL MACHINE TOOL COMPANY, Indianapolis, Indiana

EUROPEAN AGENTS: Schuchardt & Schutte, Berlin, Vienna, London, St. Petersburg, Budapest, Stockholm, Copenhagen. A. Engelman & Co., Liege, Belgium.

NATIONAL

TWIST DRILL AND TOOL CO

Here's the Point

IT is the quantity of chips removed that determines the value of a drill, as it is the accurate reaming of a greater number of holes that makes one reamer worth more than another one. These are the National selling arguments—the **amount of work** National Tools will do. We make drills and reamers with the maximum of toughness and accuracy and cutting capacity. We give them highest value to you, and consequently to ourselves. You can prove this value, as hundreds of other manufacturers have done, by the test of actual service, and demonstrate to your satisfaction, on your own work, the remarkable chip removing capacity of National Drills and the lasting accuracy of National Reamers.

The point is right here—if you want more value for the money you spend, as determined by the amount of work done, buy National Tools.

We make also, National Milling Cutters.
Send for the catalog, prices, etc.

National Twist Drill & Tool Company
Detroit **Michigan**

OFFICES: 28 Elm St., New York, N. Y., 104 S. Jefferson St., Chicago, Ill.

RESULTS TELL THE TALE

Many of the most progressive Factory Superintendents in the country are convinced of the SUPERIORITY of the

Avey Ball Bearing Drilling Machine—

Factories that *must* get high-class work as well as maximum output—QUALITY and QUANTITY—

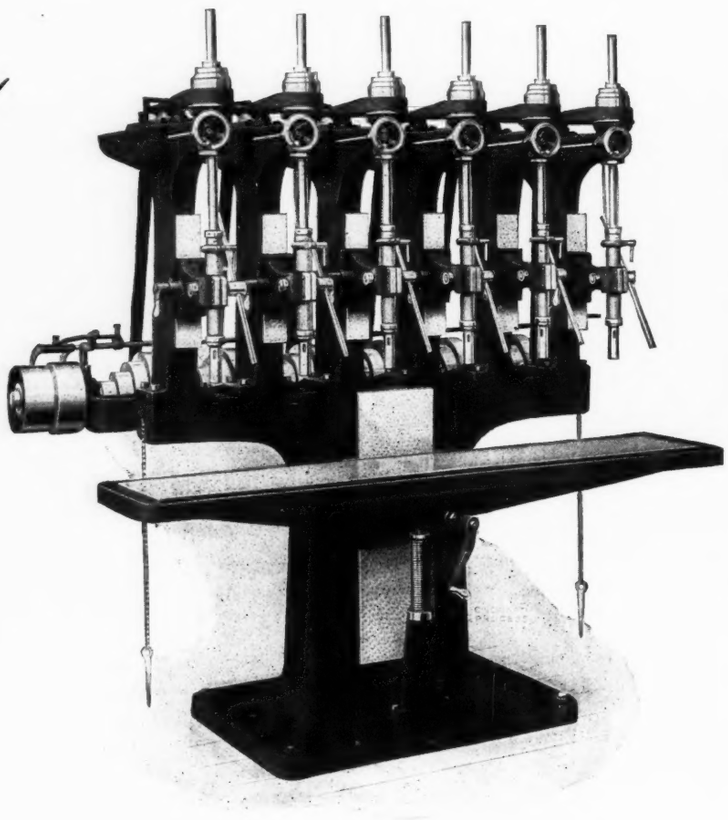
Factories that have tried out numerous lines with the determination to get absolutely the best drilling machines obtainable in order to reduce production costs to the minimum.

THE

Avey

Makes Good Every Time

There are scores of factory managers who now will have nothing else. They know that the Avey leads in advantages—that it is the simplest, most direct and positive in its adjustments, and most effective from every standard of comparison.



WE DO NOT WANT YOU TO TAKE SOMEBODY ELSE'S JUDGMENT BUT IF YOU ARE INTERESTED IN MINIMUM COSTS, WE ASK YOU TO

TRY ONE AND PROVE IT FOR YOURSELF

Write today for further particulars.

THE CINCINNATI PULLEY MACHINERY CO.

CINCINNATI, OHIO

JUST OFF THE PRESS

A Complete and Comprehensive Treatise on

LEBLOND ALL-GEARED MILLERS

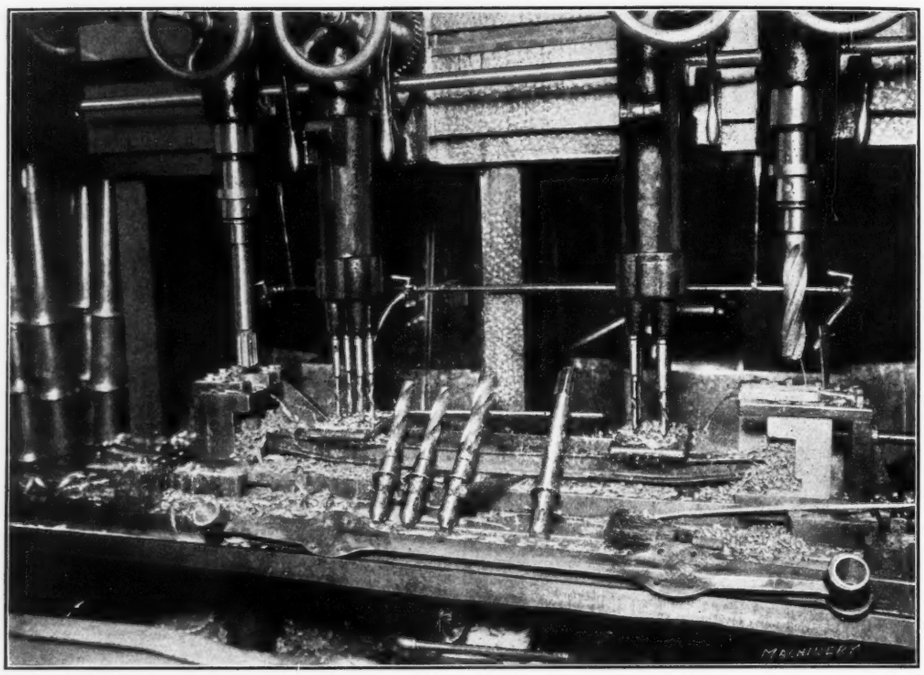
8 THE R. K. LEBLOND MACHINE TOOL CO.
THE R. K. LEBLOND MACHINE TOOL CO. 9
SPINDLE DRIVING GEARS
The Spindle and Driving Gears
Largest Face Gear used on any All Geared Miller
Longitudinal Section of Knee, Table and Saddle
The Table Feed
LeBlond Heavy Duty Single Pulley Drive Millers
LEBLOND

Tell your operators to send for a copy. It's the introduction to bigger milling profits.

THE R. K. LEBLOND MACHINE TOOL CO., Cincinnati, Ohio, U. S. A.

DOMESTIC AGENTS: Niles-Bement-Pond Co., Birmingham, Ala.; Boston, Mass.; Chicago, Ill.; New York, N. Y.; Philadelphia, Pa.; Pittsburgh, Pa.; St. Louis, Mo. Niles Tool Works Co., Hamilton, O. Caldwell Machinery Co., Seattle, Wash.; Tacoma, Wash. Eccles & Smith Co., Los Angeles, Cal.; Portland, Ore.; San Francisco, Cal. Hendrie & Bolthoff Mfg. & Supply Co., Denver, Colo. Lake Erie Machinery & Supply Co., Cleveland, O. J. L. Osgood, Buffalo, N. Y. F. E. Satterlee Co., Minneapolis, Minn. Oliver H. Van Horn, New Orleans, La. C. C. Wormer Machinery Co., Detroit, Mich.

FOREIGN AGENTS: Henri Benedictus, Antwerp, Belgium. Benson Brothers, Melbourne, Australia; Sydney, Australia. J. F. Berndes & Co., Havana, Cuba. Dodson Mfg. Co., Torreon, Coah., Mex. General Supply Co. of Canada, Ltd., Ottawa, Ont.; Toronto, Ont.; Winnipeg, Man. The General Supply Co., S. A. Mexico, D. F. Hallman Machinery Co., Vancouver, B. C. Alfred Herbert, Ltd., Coventry, Eng.; Milan, Italy. J. Lambercier & Cie., Geneve, Switzerland. Nielsen & Winthers, Copenhagen, Denmark. Rudel Belnap Machinery Co., Montreal, Que. Schuchardt & Schutte, Berlin, Germany; St. Petersburg, Russia; Stockholm, Sweden; Vienna, Austria; Budapest, Hungary; Prague, Austria; Tokio, Japan; Shanghai, China. Etablissements W. Steinhaus & Cie., Paris, France. Van Rietschoten & Houwens, Rotterdam, Netherlands. Western Machinery & Supply Co., Calgary, Alberta.



DRILLERS UPRIGHT GANG-SPECIAL HŒFER MF'G. CO. FREEPORT ILL U.S.A. FOR ALL PURPOSES

HŒFER Auxiliary Drill Heads Make Good

DRILLERS UPRIGHT GANG-SPECIAL HŒFER MF'G. CO. FREEPORT ILL U.S.A. FOR ALL PURPOSES

Because you are getting along with your everyday drilling methods, are you satisfied? Aren't you always looking for something better, more modern, fast, durable and efficient? You are in business for the profit it returns to you. Double your production without doubling the cost—use

HŒFER Auxiliary Drill Heads

These simple, compact, up-to-date heads have nearly doubled the output at the American Gear & Manufacturing Co.'s Plant, at Jackson, Michigan. They complete in one operation, work which formerly took four; in this instance drilling holes in the pads of automobile axles. If this firm is satisfied, and they are, why can't we do the same for you? Here is what they write:

November 20th, 1912.

Hoefer Manufacturing Company, Freeport, Ill.

Gentlemen:—Our experience with these heads has been entirely satisfactory to us. In the majority of cases where the jigs are so designed for their use, we can multiply the production as much as the number of spindles running in the heads over the single spindle; for instance, on a four-spindle head we will drill four holes as quickly as we used to drill one.

The heads are giving us entire satisfaction, and we are glad to recommend them.

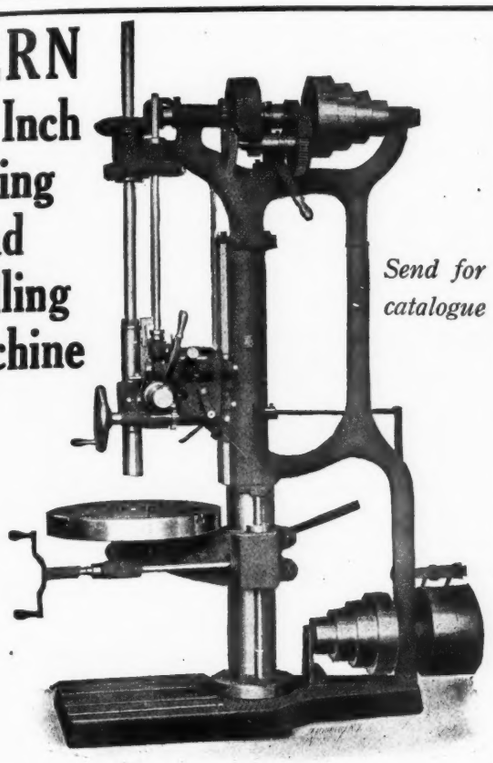
Yours very truly,

AMERICAN GEAR & MANUFACTURING COMPANY.
Per D. YOUNG.

Experts in Drillology, we are equipped to solve your drill problems—send specifications and ask for catalogue. We can furnish many convincing arguments for the **Hoefer Auxiliary Drill Heads.**

HŒFER MF'G. CO. FREEPORT, ILL., U. S. A.

KERN 25 Inch Sliding Head Drilling Machine



Send for catalogue

Feed box located on sliding head gives eight changes of direct geared feed. Driving pinions are made of steel. Teeth are planed from the solid. Table raises and lowers from the front. Many features that increase speed, strength and accuracy. Don't miss them.

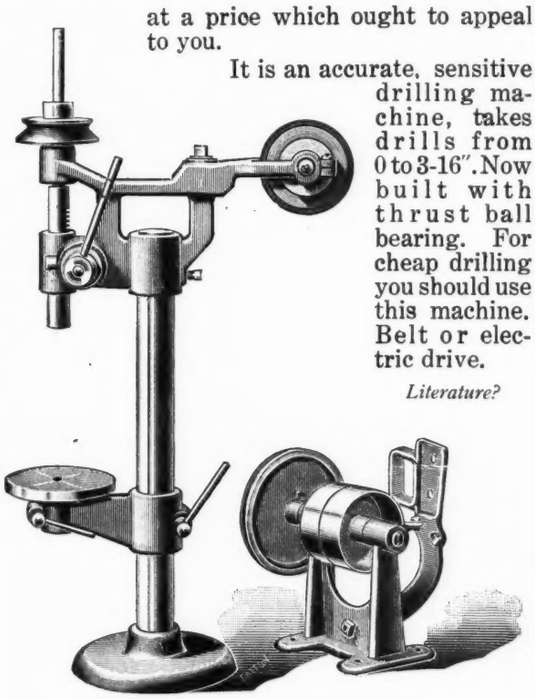
KERN MACHINE TOOL CO., Hamilton, O.

A Remarkable Little Drill

at a price which ought to appeal to you.

It is an accurate, sensitive drilling machine, takes drills from 0 to 3-16". Now built with thrust ball bearing. For cheap drilling you should use this machine. Belt or electric drive.

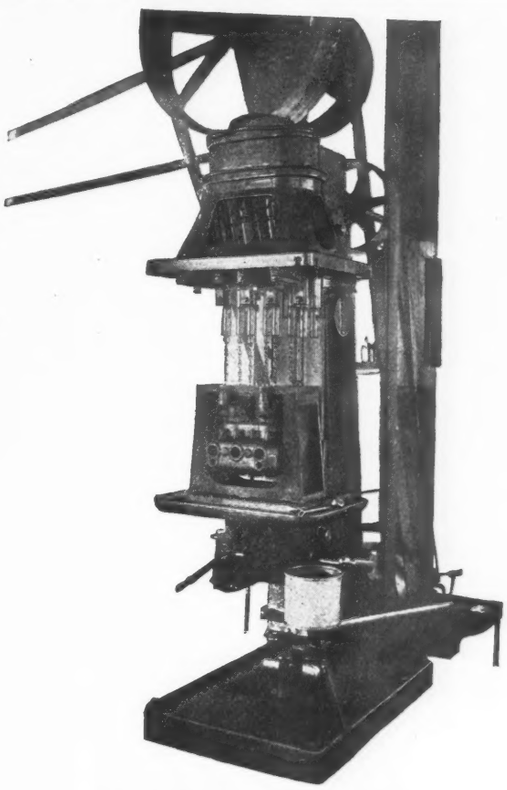
Literature?



The W. W. Oliver Mfg. Company
1500 Niagara St., Buffalo, N. Y.

TRADE FOX MARK

Supremacy IS Recognized!



BECAUSE

As this cut shows, we do not tie up your money in a big, cumbersome machine for drilling parts similar to the engine cylinder illustrated. The No. 3 Fox Multiple Spindle Drill has an extra long distance between spindles and table, allowing large castings of medium weight to be drilled upon machine.

Obtain full particulars regarding **Fox Multiple Spindle Drilling Machines for your work. We** make a **study** of **your individual requirements,** and **our Engineering Department is at your disposal.**

MAKE USE OF US TODAY

FOX MACHINE CO.
16 N. FRONT AVE., GRAND RAPIDS, MICH.
30 Church St., New York City

JOS. T. RYERSON & SON, Chicago, Illinois.
E. A. KINSEY COMPANY, Cincinnati, Ohio.
CHAS. A. STRELINGER & CO., Detroit, Mich.
SYRACUSE SUPPLY CO., Syracuse, N. Y.
ALFRED HERBERT, Coventry, England.

Billings & Spencer Drop Hammer

(PATENT IMPROVED MODEL C)

Improved board clasp catch up does away with latch and connections at side for holding ram suspended.

So located that oil cannot get between clamps and boards.

Special solid design of uprights.

No weakening perforations necessary in placing of attachments.

Weight of Drop Hammers—from 400 to 3000 pounds. Write today for descriptive catalogue.

THE BILLINGS & SPENCER CO., Hartford, Conn.

Broken Tangs? Use "Perfect Double-Tang" Sockets

What do you do with broken tang drills, otherwise in good shape? With the "Perfect Double-Tang" Socket all you have to do is grind a second tang on the shank below the one that twisted off, slip the shank into the socket, and you have practically a new drill—and all done in two to three minutes' time. The new tang fits the lower slot in the "Perfect Double-Tang" Socket and is 25% to 60% stronger than the original one. Folder 19-M gives complete details.

The CLEVELAND Twist Drill Co.

CLEVELAND NEW YORK CHICAGO

COES WRENCHES

Steel Always Reliable

WRITE

COES WRENCH CO., - Worcester, Mass.

Or, J. H. Graham & Co., J. C. McCarty & Co., N. Y.

Automatic and Special Machinery

of all kinds designed and built. Inventions perfected. Builders of Variable Speed Iron Planers. Correspondence Solicited.

ENGINEERS AND MACHINISTS

The W. A. Wilson Machine Co.

ROCHESTER, NEW YORK

$4,368.00 Saved in ONE YEAR on an Investment of $100.00

One of our customers is doing the work of 8 men on one of our **Noiseless Rotary Rivet Spinning Machines** operated by a boy.

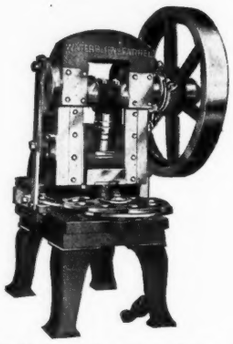
The work, when finished, has a much better appearance than can be obtained by hand or hammer blow process.

It takes but one second to head a rivet with one of these machines. Send us samples of your work and let us demonstrate to you just what can be done on these machines. *Catalog?*

The Grant Mfg. & Machine Co.

80 Silliman Ave., BRIDGEPORT, CONN.

Single Acting, Open Back Presses with Ratchet Dial Feeds



Open Back Single Acting Press (2610)

The above machine is used for truing up and sizing inside and outside, large malleable iron bushings. Send a description of your requirements.

BUILT BY

The Waterbury Farrel Foundry & Mch. Co.

WATERBURY, CONN., U. S. A.

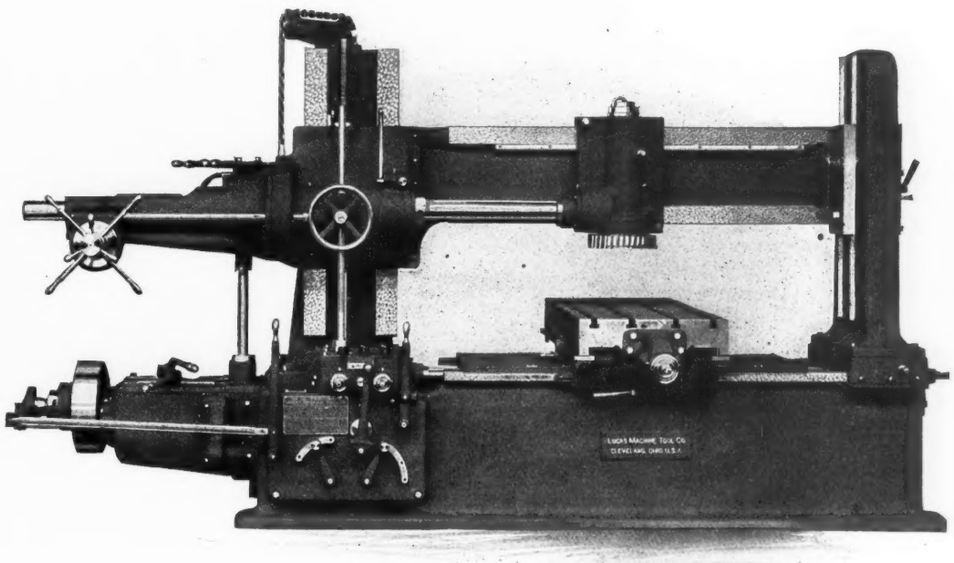
Western Office: 1012 Williamson Bldg., Cleveland, Ohio

"The way to keep the little things out is to fill one's mind with the big things."

In designing the

"PRECISION"
BORING, DRILLING AND MILLING
MACHINE

we strive for the BIG THING of a HARMONIOUS WHOLE rather than the little "talking points."



The user can't sell talking points, he must sell the PRODUCT OF THE MACHINE.

The "PRECISION" PRODUCES and KEEPS RIGHT ON PRODUCING.

LUCAS MACHINE TOOL CO., NOW AND ALWAYS OF **CLEVELAND, O., U.S.A.**

AGENTS: C. W. Burton, Griffiths & Co., London. Alfred H. Schutte, Cologne, Berlin, Brussels, Paris, Milan, St. Petersburg, Barcelona, Bilbao. Donauwerk Ernst Krause & Co., Vienna, Budapest, Prague. Overall, McCray, Ltd., Sydney, Australia. Andrews & George, Yokohama, Japan. Williams & Wilson, Montreal, Canada. H. W. Petrie, Ltd., Toronto, Ont.

applications of the most common files. This booklet has passed through seven editions and upwards of fifty thousand copies have been distributed. The work includes the most important parts of the "Treatise on Files," written by William T. Nicholson, founder of the Nicholson File Co., in 1878. It is used in the mechanical engineering courses of a number of the leading colleges and institutions, in manual training schools and by the supervisors of apprentices of several railroads and large manufacturing plants as a textbook on files and filing. The eighth revised edition is typographically attractive. The contents comprise definitions of terms, hints and suggestions as to the proper method of using files, file handles, illustrations of various cuts, names of files with illustrations, etc.

TRADE NOTES

Boston Gear Works, Norfolk Downs, Mass., will shut down for annual vacation and repairs August 15 to August 25.

Bowman-Blackman Machine Tool Co., St. Louis, Mo., dealer in machine tools, has removed to its new building, 1413 North Broadway.

Noble & Westbrook, 9 Asylum St., Hartford, Conn., makers of stamping dies, the Dwight Slate marking machine, etc., have changed their firm name to the Noble & Westbrook Mfg. Co.

Taylor & Fenn Co., Hartford, Conn., has purchased from the Whitney Mfg. Co., Hartford, Conn., the drawings, patterns and good will of the Whitney twenty-inch water tool grinder.

Lockwood, Greene & Co., 60 Federal St., Boston, Mass., architects and engineers for industrial plants, have removed their New York offices from 320 Fifth Ave. to the Architects' Bldg., 101 Park Ave. The New York representatives of the concern are Frank A. Wing and John M. Toucey.

Superior Tap Co., Charlestown, N. H., is now manufacturing the Remington two-piece thread die, formerly made by the Remington Tool & Mfg. Co. The leading feature of this die is that it may be readily separated for grinding the lands—an impossibility with the solid die. The Superior Tap Co. will manufacture this die in six sizes.

American Pulley Co., Philadelphia, Pa., has moved its New York branch from 203 Lafayette St., into more commodious quarters at the corner of Grand and Greene Sts. A complete stock of "American" belt pulleys will be carried at the new address, and orders will be taken for reels, spools, beams, sash pulleys and pressed steel shapes.

H. W. Johns-Manville Co., Madison Ave. and Forty-first St., New York City, recently opened a branch office at Charleston, N. C. The new company is located in the Commercial Bank Bldg. and is in charge of Mr. E. U. Heslop, who is assisted in covering the western section of North Carolina by P. J. McCusker and Paul W. Whitlock.

Winkley Co., Detroit, Mich., has purchased the entire bolt and automobile grease cup departments of the Penberthy Injector Co., of Detroit, including machinery and good will. The Winkley Co. will continue to manufacture and maintain the high-grade character of these goods. Mr. Alexander E. Pribil, mechanical engineer, who had charge of these departments for the Penberthy Injector Co., will continue in the same capacity with the Winkley Co.

Eveland Engineering & Mfg. Co., 2324-2328 Market St., Philadelphia, Pa. (Samuel S. Eveland, owner), has sold the entire production of the electric riveters of the factory, having an approximate value of $1,500,000 for the first year, to Manning, Maxwell & Moore, Inc., 85 Liberty St., New York City. The Eveland Engineering & Mfg. Co. is installing a large amount of new machinery to increase its output, and will manufacture transformers and electrical tempering and hardening machines as well as the Eveland electric riveters.

Catskill Foundry & Machine Works, Catskill, N. Y., recently purchased from the owners, the patterns, blueprints and drawings, also the stock of manufactured parts for the Corliss engines built by the Fishkill Landing Machine Co., Fishkill-on-Hudson, N. Y., and succeed to the business of making and furnishing repairs for this well-known line of stationary engines. George B. Van Tine, formerly superintendent of the Fishkill concern, goes with the Catskill Foundry & Machine Works, and will give personal attention to the engine work.

E. W. Bliss Co., 5 Adams St., Brooklyn, N. Y., has let contracts for a new erecting shop 200 feet long by 129 feet wide. The building will be of steel construction faced with brick and of one story with mezzanine gallery for machinery. Two 40-ton Shaw cranes of 80-foot span and one 15-ton Shaw crane of 41-foot span will be installed. The head room under the roof trusses will be 44 feet and over the erecting pits the cranes will have a head room of 44 feet. The addition will be built to meet the increasing demands for the company's large presses.

Whitney Mfg. Co., Hartford, Conn., has made plans for building another concrete addition to its factory. The addition is to be 60 feet wide, 112 feet long and four stories high, making an addition of 26,880 square feet of floor space. The recently completed two-story building 50 by 180 feet is being equipped with machinery, etc. The company has sold its twenty-inch water tool grinder to the Taylor & Fenn Co. of Hartford, Conn., and will now devote its entire attention to the manufacture of high-grade driving chains, keys and cutters for the Woodruff system of keying, and hand-feed milling machines.

Miscellaneous Advertisements—Situations, Help Wanted, For Sale, etc.

Advertisements in this column, 20 cents a line, seven words to a line. The money should be sent with the order. Answers addressed to our care will be forwarded. Original letters of recommendation should not be enclosed to unknown correspondents.

HARDENING and METAL TREATING.—C. U. SCOTT, Davenport, Iowa.

TEST INDICATORS.—H. A. LOWE, 1374 East Eighty-eighth St., Cleveland, Ohio.

WELLES TOOLS are different. Get a catalogue and price list. WELLES CALIPER COMPANY, Milwaukee, Wis.

WANTED.—Either foundry or machine shop job work on heavy castings. BERTSCH & COMPANY, Cambridge City, Ind.

AGENTS IN EVERY SHOP WANTED to sell my sliding calipers. Liberal commission. ERNST G. SMITH, Columbia, Pa.

WANTED.—Second-hand spot welder. Must be in good shape. Address Box 575, care MACHINERY, 49 Lafayette St., New York.

WANTED.—DRAFTSMAN who has had experience in designing Presses, Punches, Shears and Rolls. BERTSCH & COMPANY, Cambridge City, Ind.

PLEASE SEND CATALOGUE on large and small machine tools and supplies for library of YOUNG MEN'S TECHNICAL CLUB, Sixth & Taylor, Portland, Oregon.

PATENTS SECURED. — C. L. PARKER, Ex-member Examining Corps U. S. Patent Office. Instructions upon request. 900 G St., N. W., Washington, D. C.

WANTED.—A line of heavy machinery to build, either to build on contract basis, or might buy patterns and drawings. BERTSCH & CO., Cambridge City, Ind.

MACHINERY DESIGNED and improved in a practical way, results guaranteed. Labor saving devices and inventions perfected. PERRY, 357 North 7th St., Newark, N. J.

DIEMAKERS WANTED.—Fifty-one hours, open shop, highest wages paid, good mechanics, steady work. Address Box 567, care MACHINERY, 49 Lafayette St., New York.

AUTOMATIC AND SPECIAL MACHINES designed. Working drawings. Tracings. Special Tools and Fixtures designed. C. W. PITMAN, 3519 Frankford Ave., Philadelphia, Pa.

WE DESIGN mill and factory buildings, engines, boilers, special machinery and cranes. We also do tracing and blue-printing. THE DRAFTING CONCERN, Box 13, Sta. B., Cleveland, O.

WANTED.—Several First Class Ordnance and Turret Draftsmen. Give fully, age, experience, education and references. Address Box 562, care MACHINERY, 49 Lafayette St., New York.

COST SHEET giving cost of fuel for oil, gas and steam engines and current for electric motors; at all prices and rates of consumption; folding pocket size, 10c, stamps or coin. A. STRITMATTER, 210 E. 7th, Cincinnati, Ohio.

AGENCY.—Mechanical Engineer with successful selling experience desires thoroughly substantial agency in any line of machinery, to handle St. Louis business. Address Box 572, care MACHINERY, 49 Lafayette St., New York.

WANTED IN OHIO.—Competent man with thorough knowledge of hardening small tools, cutters, reamers, taps, drills, etc. (carbon and high speed steel). Address Box 581, care MACHINERY, 49 Lafayette St., New York.

WANTED. — FIRST-CLASS OPERATOR for Landis, and Brown and Sharpe Universal Grinding Machines in Rochester, N. Y. Give references and salary expected. Address Box 578, care MACHINERY, 49 Lafayette St., New York.

FOR SALE.—5748 steel tubes ⅝" O. D., No. 16 Gauge, 20 inches in length. 5680 steel tubes ⅝" O. D., No. 16 Gauge, 16 inches in length. All in perfect condition. Address Box 569, care MACHINERY, 49 Lafayette St., New York.

DRAFTSMEN AND MACHINISTS.—American and foreign patents secured promptly; reliable researches made on patentability or validity; twenty years' practice; registered; responsible references. EDWIN GUTHRIE, Corcoran Building, Washington, D. C.

WANTED. — Toolmakers', machinists' attention. Complete and surprising features in our newly issued circular (No. 3), on Boulet's Universal Micrometer Test Indicator. Write to-day to BOULET'S FINE TOOL WORKS, Sebago Lake, Maine.

PATENTS.—H. W. T. JENNER, patent attorney and mechanical expert, 606 F St., Washington, D. C. Established 1883. I make a free examination and report if a patent can be had, and the exact cost. Send for full information. Trade-marks registered.

MANUFACTURERS' AGENT, established in Portland, Ore., can handle a few more good agencies in Oregon or Pacific Northwest, for steam, electrical, pumping and mill machinery and supplies. Address Box 579, care MACHINERY, 49 Lafayette St., New York.

METAL PATTERN FINISHERS, TOOL AND DIE MAKERS.—Rapid business expansion necessitates employment of few first-class men. Work 57 hours per week. Good location. Furnish references and state hourly wages expected. THE FULTON COMPANY, Knoxville, Tenn.

REPRESENTATIVES WANTED in different trade centers to secure contracts for small and medium size machine work on commission basis. Full particulars furnished upon request. THE UNIVERSAL TELEGRAPHIC & MACHINE CO., The Industrial Building, Baltimore, Md.

FOR RENT.—Factory floor space in large or small quantity at Racine, Wisconsin, on tracks of C. M. & St. P. Railway and C. & N. W. Railway. Labor, transportation and power facilities unexcelled. Address for particulars—CARPENTER & ROWLAND, Hotel Racine Bldg., Racine, Wis.

SITUATION WANTED.—Having had four years' experience in a steel room of a large manufacturing company, I wish to make a change to a similar position or better one. I am single and 30 years old, willing to go out of town. Write all letters to T. R., Box 577, care MACHINERY, 49 Lafayette St., New York.

FOR SALE.—One 2¼ x 24" Jones & Lamson flat turret lathe, cross feed head, single pulley, arranged for motor drive. This machine is arranged for bar and truck work and is in operative condition. It may be seen at our plant and price will be quoted on request. THE HOBART MANUFACTURING CO., Troy, Ohio.

ENGINEERS, SUPERINTENDENTS, designers, draftsmen, production engineers, master mechanics, auditors and other high-grade men are invited to file their professional records with us for vacancies now open and in prospect. Only high-grade men whose records can stand investigation need apply. THE ENGINEERING AGENCY, Inc.—20th Year—Chicago.

FACTORY MANAGER WANTED.—A growing business in the East with ample capital and large plant, entirely new, wants a factory manager, 30 to 40 years old; experienced in scientific management and preferably a technical college graduate. Good opportunity for the right man. Address with full particulars Box 576, care MACHINERY, 49 Lafayette St., New York.

WE ARE EXCEPTIONALLY WELL FITTED to build your light and medium weight machines on contract in reasonable lots. Can store finished material, shipping direct to consumer your single orders or in lots and take the factory end entirely off your hands. Best of shipping facilities. Prompt and efficient service. High-class workmanship. Prices right. HOYSRADT & CASE, Kingston, N. Y.

FOREMAN WANTED for a live, growing Northern New York Machine Shop. A first-class energetic all-around American mechanic able to handle men to advantage, keeping costs down and quality of work up to standard; some knowledge of mechanical drawing; state where formerly employed, experience and salary expected; references required. Address Box 580, care MACHINERY, 49 Lafayette St., New York.

FOR SALE.—One 55 H. P. three-cylinder Westinghouse Gas Engine complete with compressed air tank, pump, generator and batteries of very recent model, used but little and kept in perfect condition. One 20 H. P. two-cylinder No. 5 Nash Gas Engine with small generator and batteries. Can show either one of these engines in working condition and will make an exceptionally low price for cash. PARKS & WOOLSON MACHINE CO., Springfield, Vt.

ONE OF THE LARGEST and most progressive tool and supply houses in New York City is desirous or disposing of their business; stock on hand, capital stock and good will, having a satisfactory lease in a convenient section of the city. Satisfactory reasons given for desire to sell. Business is now a growing one and can do 50 per cent more business without increasing the overhead, owing to excellent organization. Purchasers only need apply, no agents. Address X. Y. Z., Box 556, care MACHINERY, 49 Lafayette St., New York.

WANTED. — Agents, machinists, toolmakers, draftsmen, attention! New and revised edition Saunders' "Handy Book of Practical Mechanics" now ready. Machinists say, "Can't get along without it." Best in the land. Shop kinks, secrets from note books, rules, formulas, most complete reference tables, tough problems figured by simple arithmetic, valuable information condensed in pocket size. Price post paid $1.00 cloth; $1.25, leather with flap. Agents make big profits. Send for list of books. E. H. SAUNDERS, 216 Purchase St., Boston, Mass.

WANTED.—A thoroughly high-class Foundry Superintendent, who is familiar with moderately heavy, high-class machine tool work. Must thoroughly understand modern molding, mixing of iron, and be an executive of the highest order. Foundry is modern and complete in every way, and man is desired to take absolute charge. Technically educated man about 35 years of age preferred. State previous experience, with whom, past salaries received, whether married or single, and give full other particulars. An excellent opening for a high grade man. Address Box 582, care MACHINERY, 49 Lafayette St., New York.

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Absolutely Reliable

SPRINGS

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F & G STEEL MUSIC WIRE

The Celebrated Felten & Guilleaume Imported Steel Music Wire
makes the Most Dependable Springs and Formed Wire Products.

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Hardware, Tools and Supplies

New York, Since 1848 4th Avenue and 13th Street

HUNTINGTON
EMERY WHEEL DRESSER
CUTTERS

Through years of experimenting in manufacturing Cutters we have finally succeeded in procuring a peculiarly hard, tough material, which we can now depend upon for absolute uniformity, and by means of our special hardening process are making a cutter *better than the best.*

**If you have had trouble with your cutters,
try our Huntington!**

Sample sent upon request — Send us Specifications to quote

HAMMACHER, SCHLEMMER & CO.

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4th Avenue & 13th Street New York, Since 1848

ARMSTRONG TOOLS ARE BEST

Drop Forged Lathe Dogs with Tool Steel Screws

Write for Special Booklet

Straight Shank Turning Tool

Left Hand Off-Set Side Tool

Straight Shank Cut-Off Tool

Left Hand Off-set Cut-Off Tool

Left Hand Turning Tool

Planer Tool

Wrenches Drop Forged

All Kinds and Sizes

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The New Armstrong Adjustable Boring Tool

Patented

WILL CUT THE TIME ON THAT BORING JOB

The bars are held in V yoke and all sizes come to same center without changing height of Holder.

Bars ¾ to 2¼ inches in diameter.

4 Sizes

THE ARMSTRONG IDEA

TOOL HOLDER PROFIT

No Forging.
Mighty Little Tool Steel.
Minimum of Grinding.
Machines All Running.
Men All Working.

FORGED TOOL LOSS

Blacksmiths' Time, etc.
Large Stock of "Dead" Tools, Steel, etc.
Men Waiting at Forge or Tool Room.
Machines Standing Idle.
Wasted Time and Material Grinding Tools.

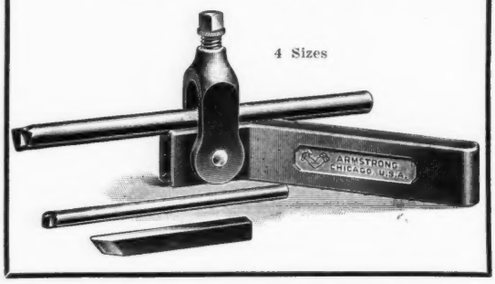
Another New One The Armstrong Boring Tool Holder

Patented

For Small, Light Boring, Threading, Etc.

IT IS REVERSIBLE AND CAN BE USED AS EITHER RIGHT OR LEFT HAND OFFSET TOOL FOR TURNING.

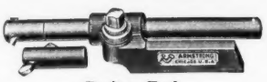
4 Sizes



Drop Forged "C" Clamps

Both Heavy and Light Design

Write for Special Booklet



Boring Tool

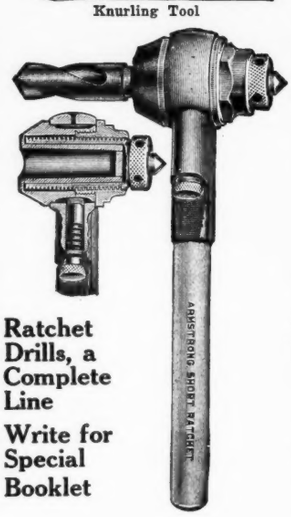
Right Hand Off-Set Side Tool

Threading Tool

Right Hand Off-Set Cut-off Tool

Right Hand Turning Tool

Knurling Tool



Ratchet Drills, a Complete Line

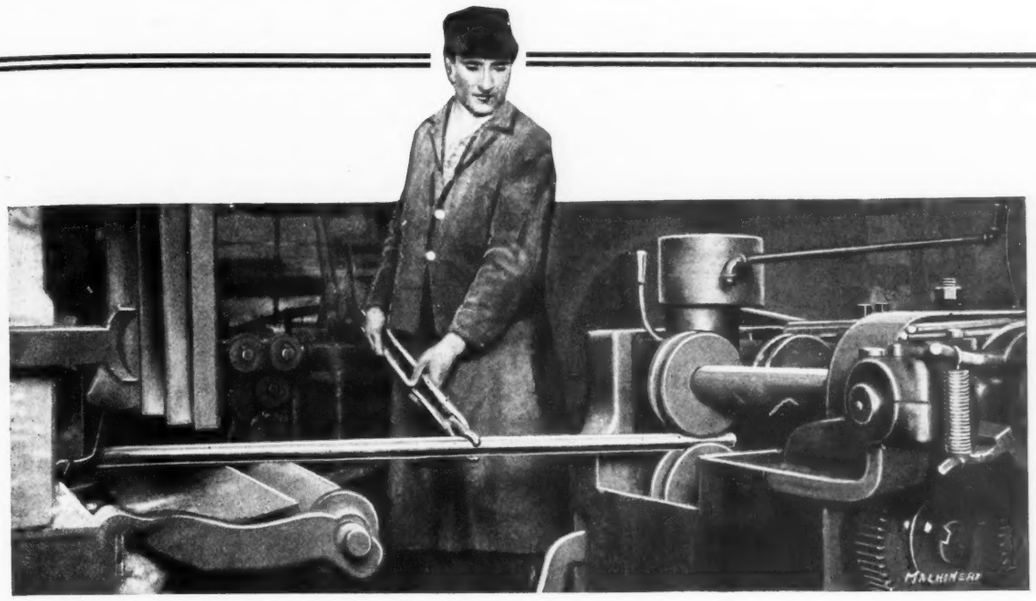
Write for Special Booklet

Our New General Catalog A-12, sent for the asking

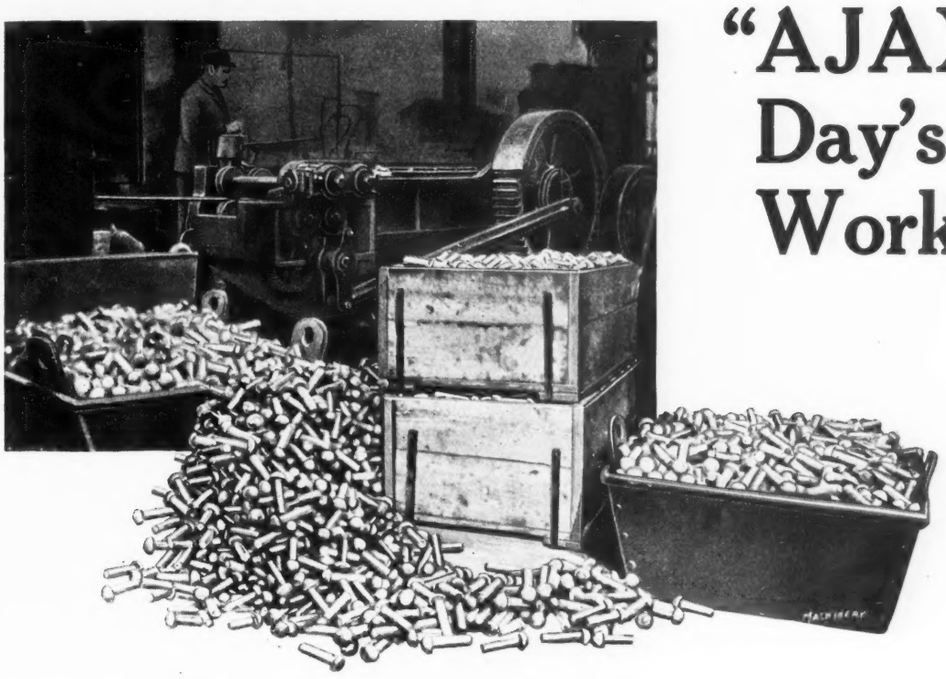
ARMSTRONG BROS. TOOL CO.

"THE TOOL HOLDER PEOPLE"

313 N. FRANCISCO AVE. CHICAGO, U. S. A.



10 Tons 1¼ Inch Rivets An "AJAX" Day's Work



This Ajax Automatic Feed Rivet Machine cuts the stock from the bar, heads and finishes the rivet and ejects it into the pan—one rivet for every revolution—10 tons per day. The rivets are all made at the same heat. All the operator does is to start the 30-foot bars from the furnace into the feeding rolls. Think what this speed, accuracy and economy of production means on an item like rivets where competition is so keen.

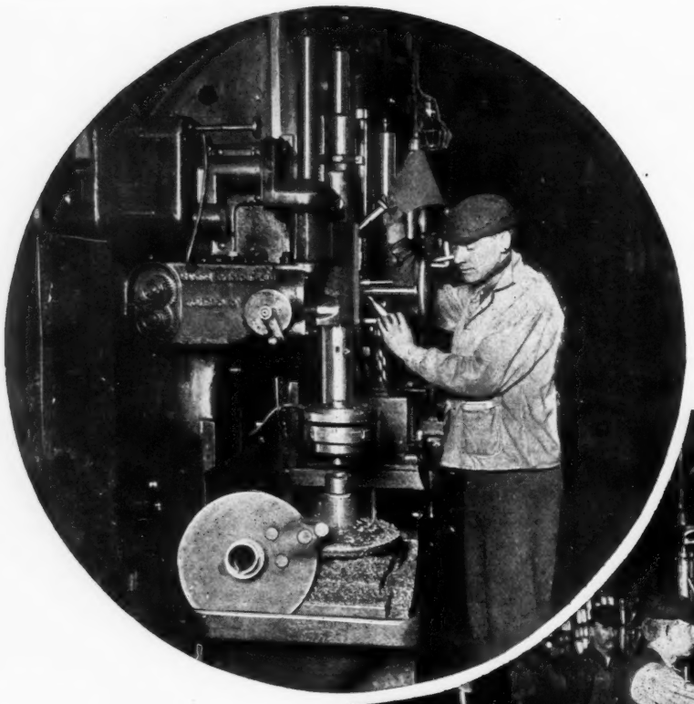
This Ajax Machine is so simple in operation and so substantial in construction that it will do this work day after day with almost no attention or repairs.

The cast-steel bed plate, continuous crank-shaft housings, phosphor bronze bushings, perfect lubrication and automatic die relief are all features which make for long service and protect the machine against damage.

This is only one machine of a large line for hot metal work. Write for the catalogue describing them all.

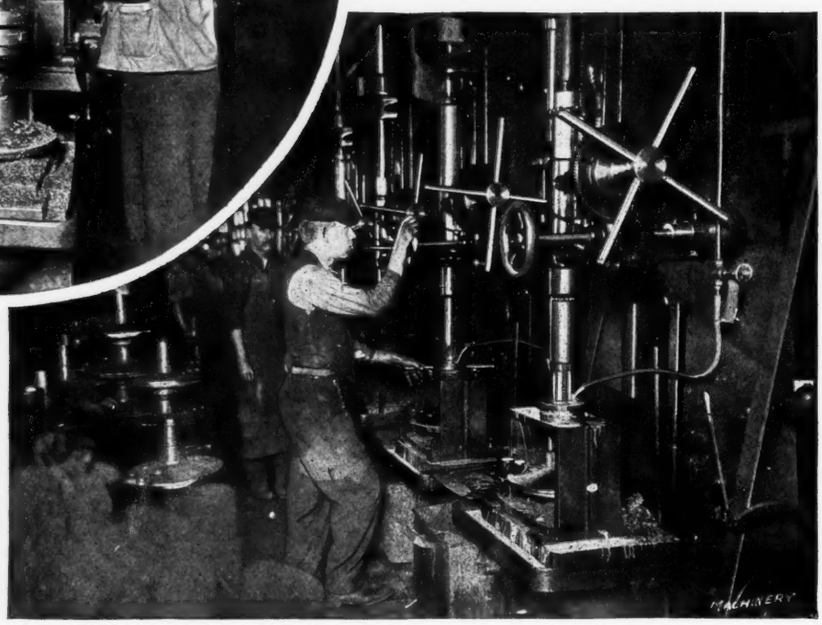
THE AJAX MANUFACTURING CO., Cleveland, O.

CHICAGO OFFICE: 621 Marquette Bldg. **NEW YORK OFFICE: 1369 Hudson Terminal**



"IT'S A BAKER"

Machining Brake Supports



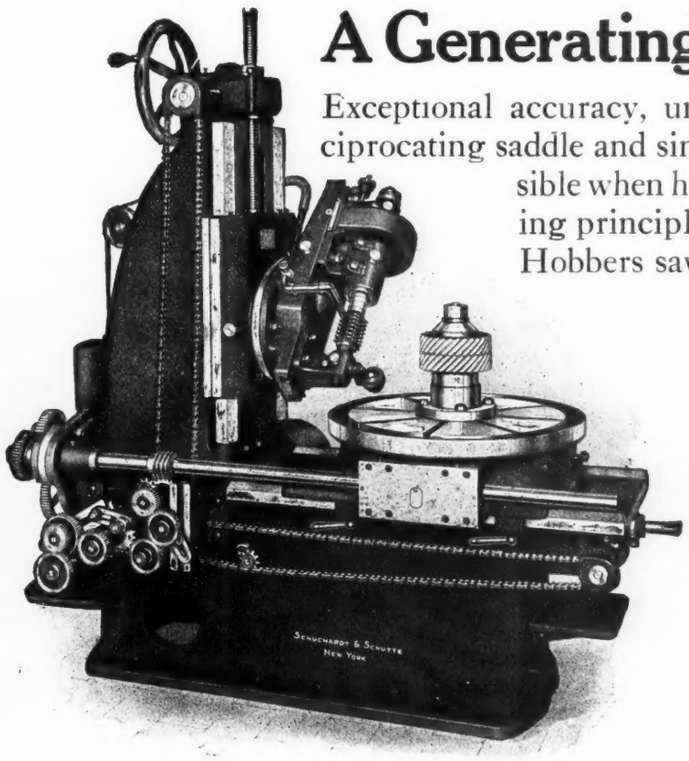
The Reo Motor Car Company, Lansing, Michigan, uses five Baker High Speed Drilling Machines for boring, reaming, facing and turning brake supports. Four of these Bakers rough and finish bore and ream the holes in both ends of the supports. As this hole goes completely through the casting, but has two diameters, the first Baker drills a hole 2.558″ diameter, which is finish reamed on the second machine 5.5655″ diameter, to a square shoulder 5¾″ deep.

The casting is then placed in a jig on the third Baker Drilling Machine and a rough bore to 3.960″ diameter taken in the other end; the top, 4¾″ diameter, is then faced. A fourth Baker finish reams the casting to 3.990″ diameter, 2¼″ deep. One hundred and ten of these finished brake supports are turned out in nine hours, including *all* operations.

The brake casting is taken from this set of Baker Drilling Machines to a fifth Baker, where a large inserted tooth hollow miller takes a ⅜″ cut in the hub, 3″ diameter by 3″ long being the finished dimensions. Two hundred finished malleable iron castings is the nine-hour capacity of this one machine.

Profit by using Baker High Speed Drilling Machines. Let us show you how. Guaranteed estimates gladly furnished. Catalogue upon request.

BAKER BROTHERS, Toledo, O., U.S.A.



A Generating Gear Hobber

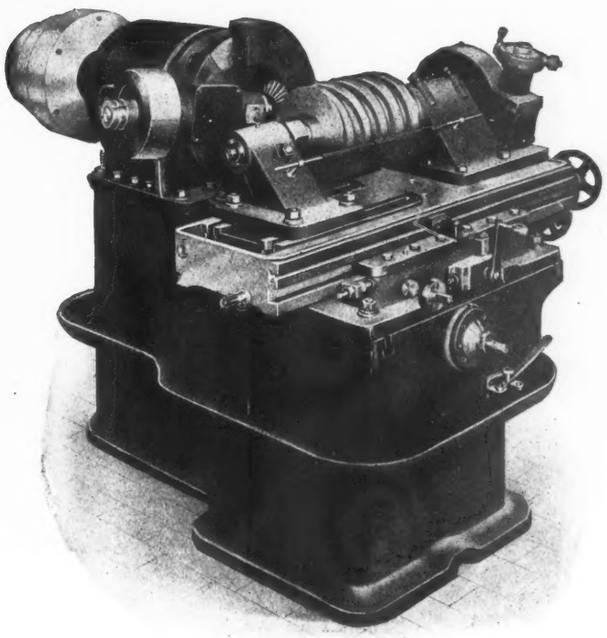
Exceptional accuracy, unattainable on ordinary reciprocating saddle and single cutter machines, is possible when hobbing gears on the generating principle. S. & S. Generating Gear Hobbers save time—no idle return motion or extra traverse required for dividing; hob is always in contact with the work. Smooth, uniform gears are assured, as whole operation is even and continuous; no jar or shock. Simple construction, easy manipulation. You'll be interested in our catalogue on *generating* gear hobbers.

S & S Thread Milling Machine

This machine, especially designed for thread milling, will cut threads within the closest limits of error and at a fraction of the cost of screw-cutting on ordinary engine lathes.

S. & S. Thread Milling Machines have from two to eight times the capacity of a lathe; fully automatic; can mill spiral gears up to 10″ diameter.

Let us mail you specific information on S. & S. Machines as applied to *your* work.



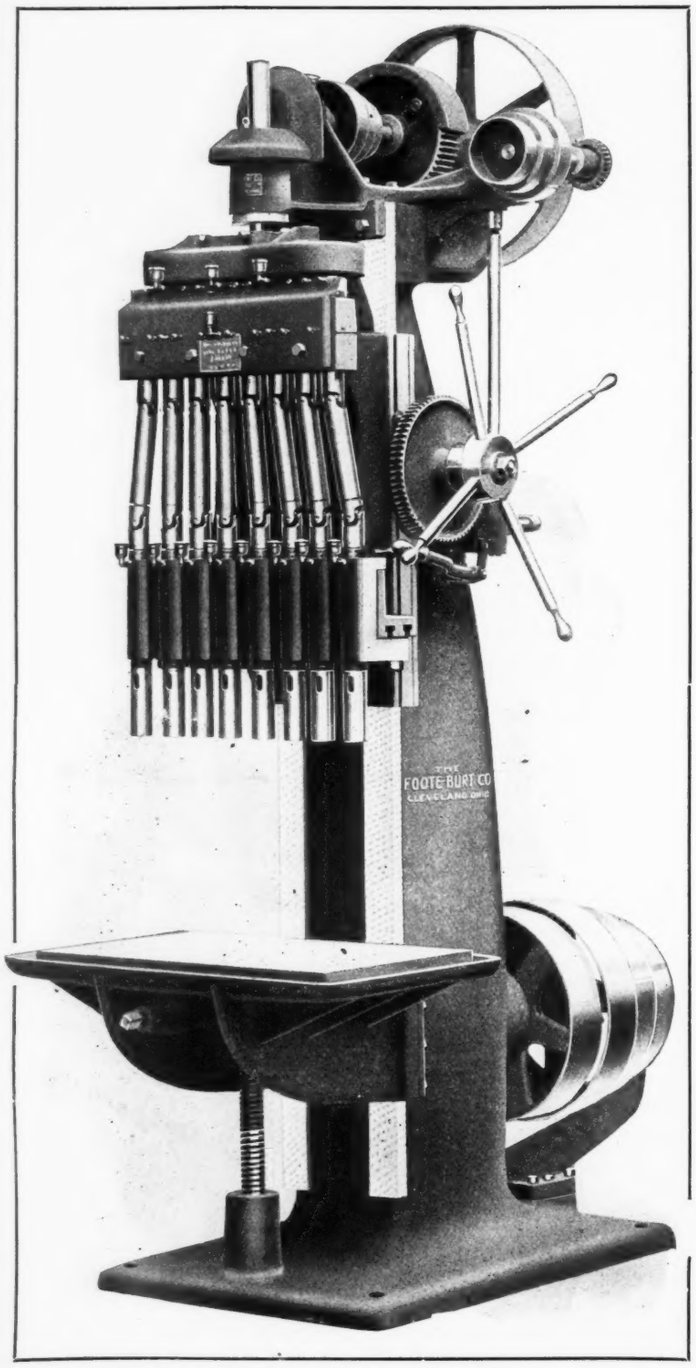
Write for catalogue.

SCHUCHARDT & SCHUTTE

Cedar and West Streets **NEW YORK, N. Y.**

Foote-Burt No. 15½ Adjustable Drill

A Rigid, Powerful Machine For Drilling in a Straight Line



THIS is a machine which we have furnished to many of the large automobile engine manufacturers for finishing valve holes in cylinders; the number of spindles depending upon the castings, whether twin, four cylinder or six cylinder bloc castings. The complete set of valve holes can be finished on this machine as fast as it would be possible to finish a single hole on a single spindle machine.

¶ The machine is efficient and productive not only for gas engine work, but for other lines of manufacturing where holes are in a straight line. It is sturdy and rigid, with power to drill 1" holes in solid cast iron and 2½" cast iron cored holes.

¶ It is arranged with friction throwout back gears which give a wide range of speeds—especially valuable in gas engine work when different speeds are required for boring the valve cages and for the drilling and reaming required in the valve stem holes.

¶ The spindles are bolted to the cross rail by two bolts and are clamped to the upper part of rail—a particularly rigid construction. Ball joints are of special design; spindle drive gears are made of 3½% nickel steel. Column is heavy, table is well ribbed and elevated by massive jack screws and spiral gears.

¶ We make two types of this machine with from two to twelve spindles; one type adjustable in a straight line only, the other arranged with fixed centers. Fixed center machine is a "special," but can be furnished for any straight line layout in very short time.

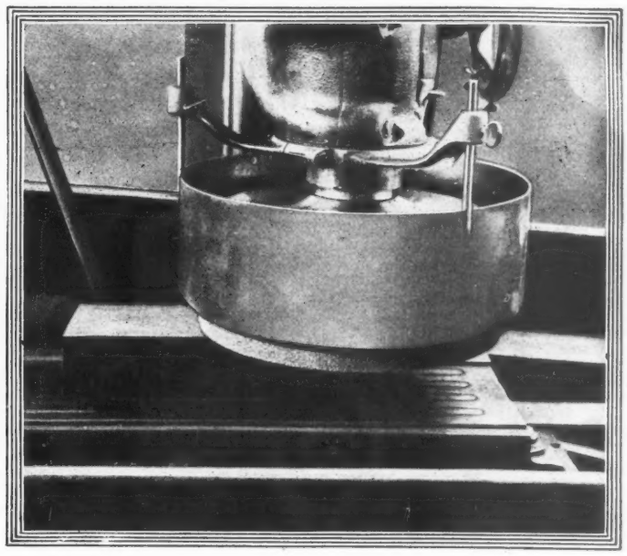
THE FOOTE-BURT COMPANY

CLEVELAND, OHIO, U. S. A.

DETROIT OFFICE—827 Ford Building.

FOREIGN AGENTS: Buck & Hickman, Ltd., London, Birmingham, Manchester and Glasgow. Moscow Machine Tool & Engine Co., Moscow. Ing. Ercole Vaghi & Co., Milan. R. S. Stokvis & Zonen, Rotterdam. R. S. Stokvis & Fils, Brussels. Heinrich Dreyer, Berlin. Glaenzer & Perreaud, Paris, agents for France, Switzerland, Spain and Portugal. Thomas McPherson & Son, Melbourne. Mitsui Co. agents for Japan, Korea and Manchuria. Wilh. Sonneson, Malmo, Sweden, and Copenhagen, Denmark.

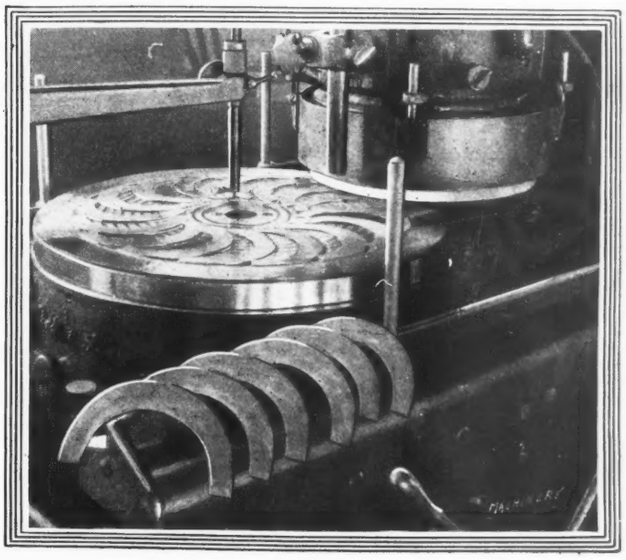
NORTON WHEELS for Vertical Surface Grinding



Vertical surface grinding is one of the modern methods of rapid finishing—but the success of this type of grinding is dependent upon the wheel employed. A wheel that crumbles or a wheel that glazes will rob vertical surface grinding of its advantages.

Norton engineers have made a study of grinding wheels for vertical surface grinding. They have been able to bring out types of wheels adapted for surface grinding on steel, cast iron or brass—each one the best possible wheel for its purpose.

Norton Research—Norton Engineers —Norton Experience are yours for the asking—write us.

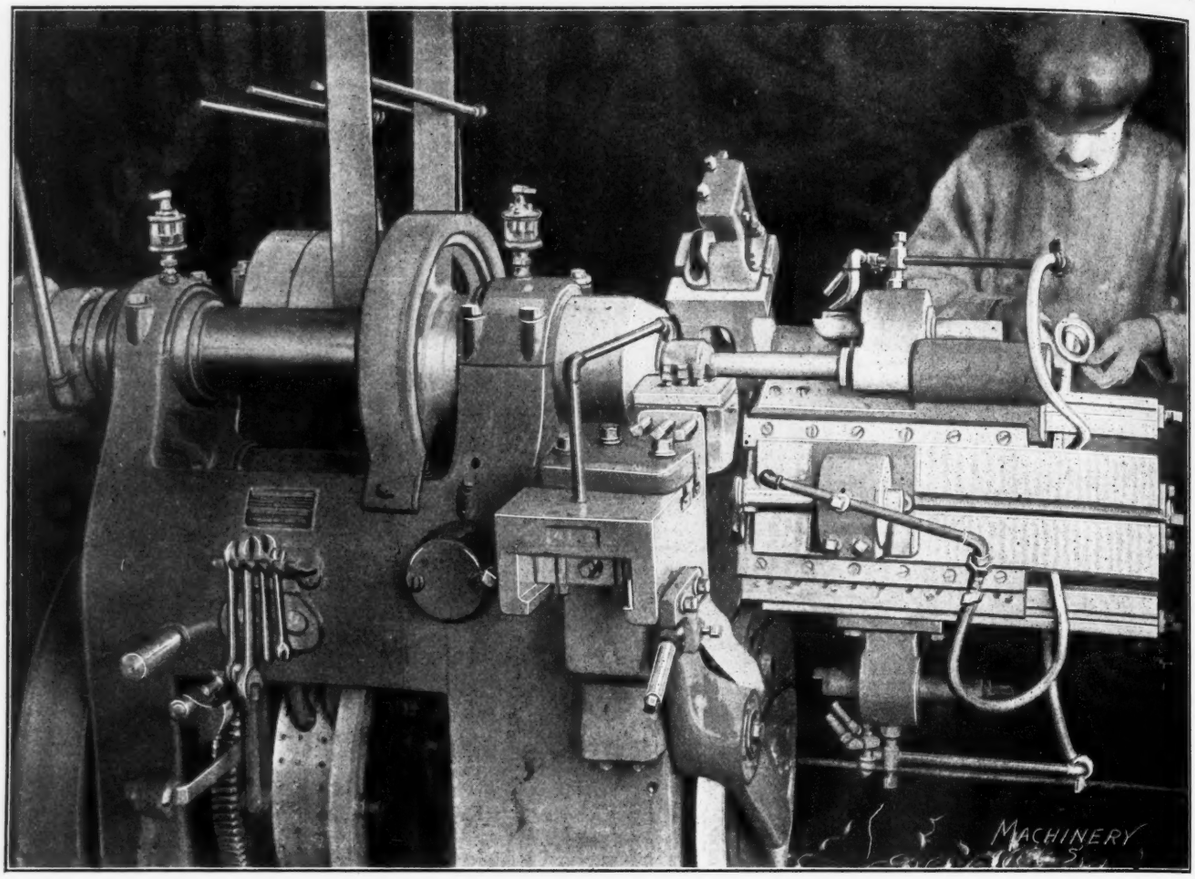


NORTON COMPANY

WORCESTER, MASS., U.S.A.

ALUNDUM PLANT, NIAGARA FALLS, N.Y.
CRYSTOLON PLANT, CHIPPAWA, CANADA.
NEW YORK STORE, 151 Chambers Street
CHICAGO STORE, 11 N. Jefferson Street

THIS GRIDLEY AUTOMATIC



This is the piece—a cone for one of the ball bearings which the Henry & Wright Manufacturing Company, Hartford, Conn., put into their ball bearing drilling machines. The cone is made of the hardest kind of imported steel, difficult material to machine in any way, let alone on an Automatic. The piece is turned up from heavy tube stock, is drilled and formed for the race section and dropped from the machine complete and ready for hardening.

It is a tough job, tough steel, tough on the tools and on the machine; but the Gridley was built to handle tough jobs. Although this machine has been installed for a few weeks only, *production on this one job has been increased four-fold.*

Gridley Automatics are cutting production rates wherever they are employed; they are doing better work and more of it—the surest way in the world to lower costs. Let them do this for you.

Let us tell you more about these machines.

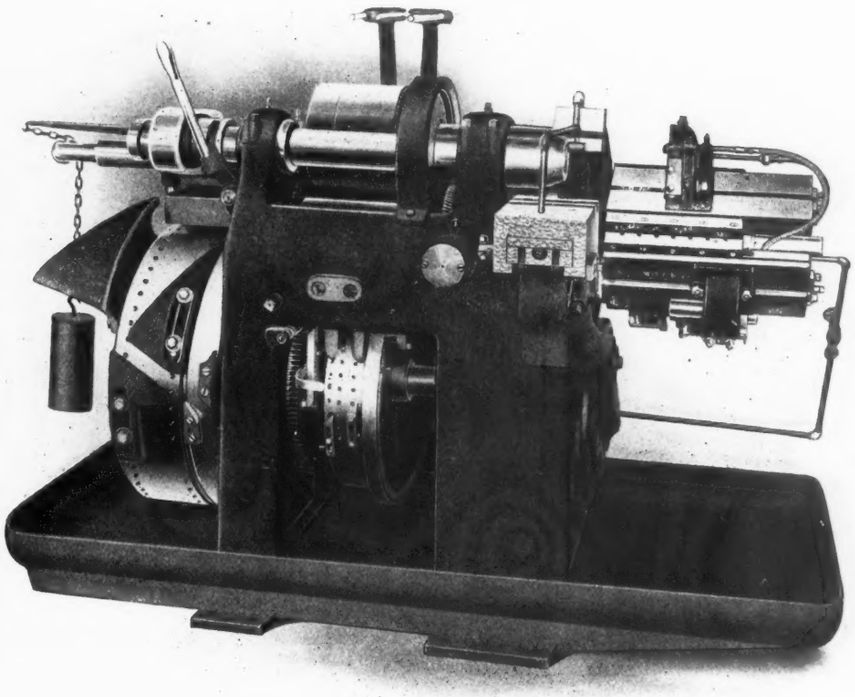
WINDSOR MACHINE COMPANY

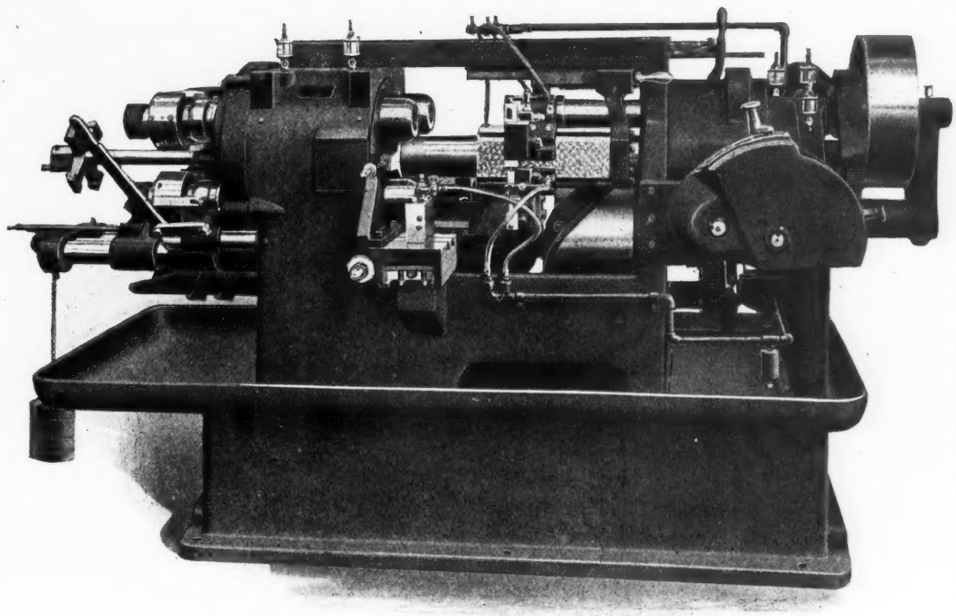
OFFICE FOR GREAT BRITAIN, FRANCE, BELGIUM AND SWITZERLAND.
68 AVENUE DE LA GRANDE-ARMEE, PARIS. J. RYAN, MANAGER.

JUMPED PRODUCTION FOUR-FOLD

The Single Spindle Gridley Automatic Turret Lathe

is a remarkably wide range machine. The spindle revolves without change of position while the turret with its attached slides, on which the tools are mounted, is revolved on a longitudinal axis to bring the tools into working position. This construction opens up possibilities practically without limit when proper attention is given the matter of set-up.





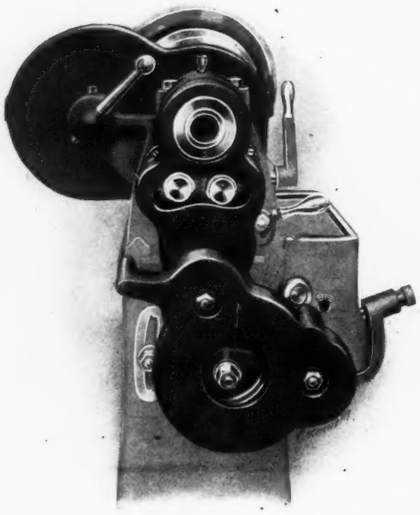
The Multiple Spindle "Gridley"

has not the range of the Single Spindle Machine; but it is a greater producer. The four spindles are revolved, carrying the four bars into successive alignment with the tools which are fed to the work by a longitudinal movement—a construction which makes for enormous outputs.

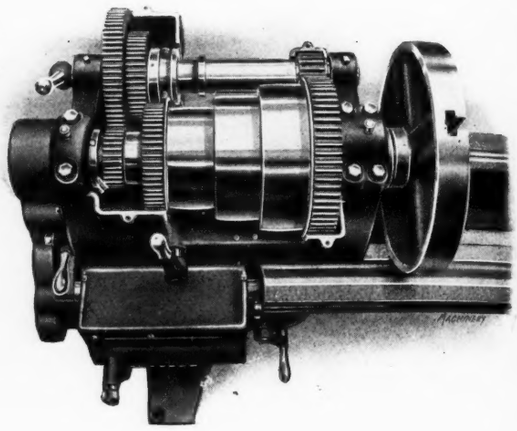
WINDSOR, VERMONT, U. S. A.

FOREIGN AGENTS: Craven Bros., Ltd., Manchester, England, Great Britain and Colonies. Chas. Churchill & Co., London, Birmingham, Manchester and Newcastle-on-Tyne, England, and Glasgow, Scotland. M. Koyemann, Charlottenstrasse 112, Dusseldorf, Germany, Austro-Hungary, Italy, Norway, Sweden. Schuchardt & Schutte, Norway, Sweden, Russia, China, Japan.

The New Gear Guards

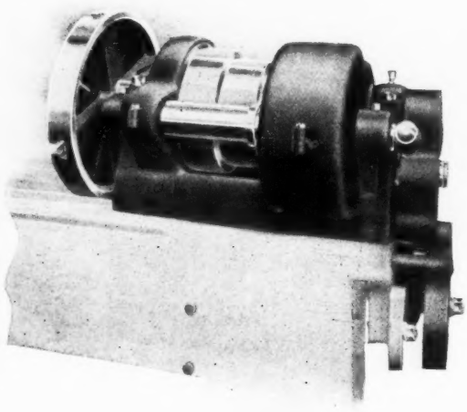


END VIEW

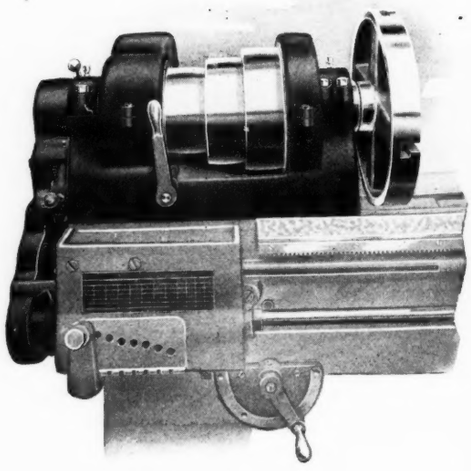


TOP VIEW

Look on all sides of a lathe before buying it. Many look well guarded from the front, but it takes the "WALCOTT" to show up well from all sides.



BACK VIEW

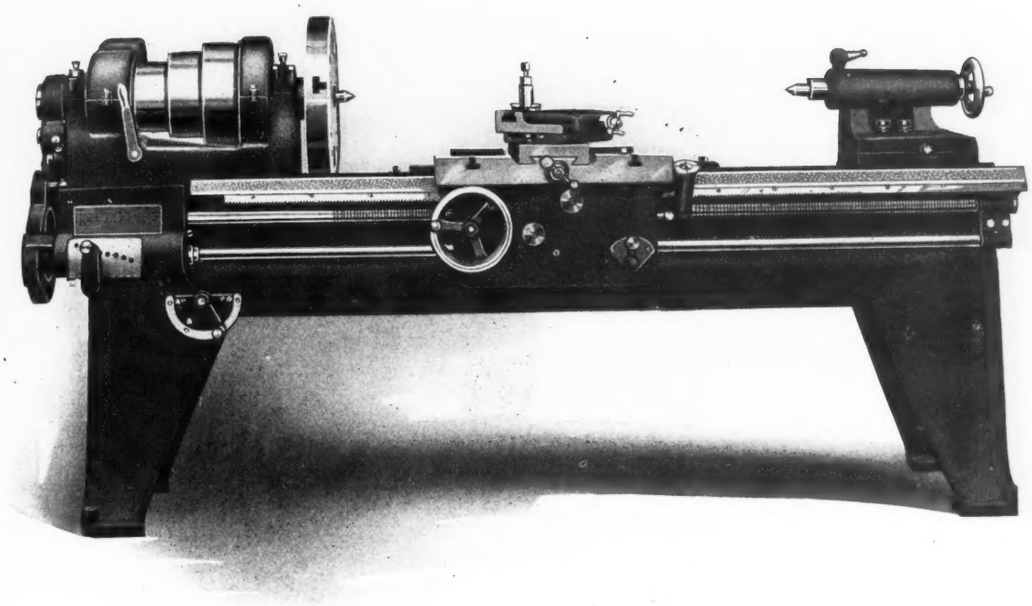


FRONT VIEW

WALCOTT & WOOD MACHINE TOOL

IN STOCK AT—H. A. Stocker Machinery Co., Chicago, Ill.
National Supply Co., Toledo, Ohio

on "Walcott" Lathes



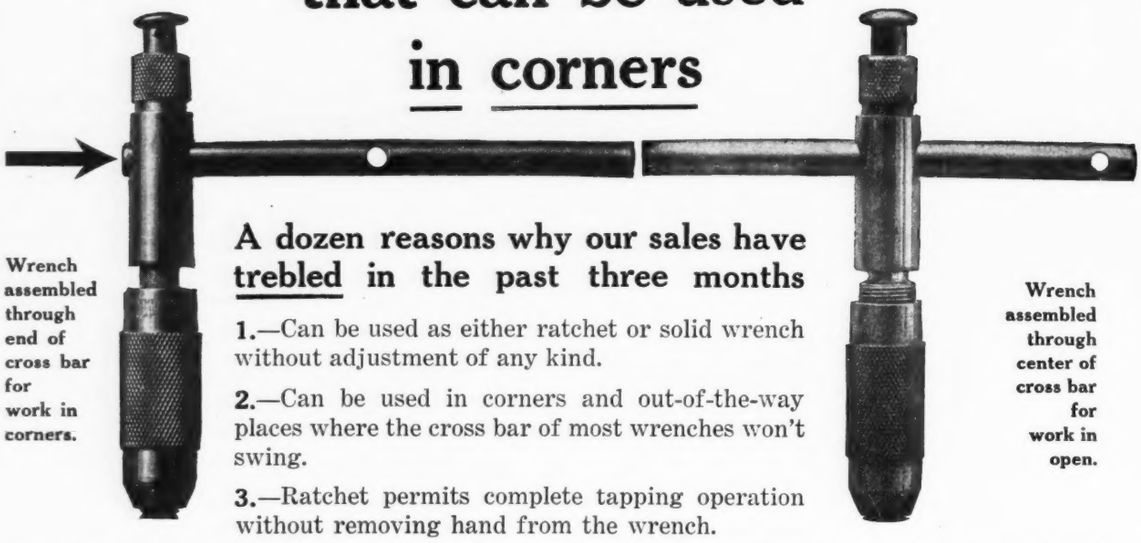
16" x 8' "WALCOTT" LATHE

Double plate apron
Drop forged gears in apron
Steel gears in gear box
Deep bed
Large ways on bed

COMPANY, Jackson, Michigan, U. S. A.

Lake Erie Machinery & Supply Co., Cleveland, Ohio
W. J. Baird & Co., Detroit, Mich.

Here's the Only Ratchet Tap Wrench that can be used in corners



Wrench assembled through end of cross bar for work in corners.

Wrench assembled through center of cross bar for work in open.

A dozen reasons why our sales have trebled in the past three months

1.—Can be used as either ratchet or solid wrench without adjustment of any kind.

2.—Can be used in corners and out-of-the-way places where the cross bar of most wrenches won't swing.

3.—Ratchet permits complete tapping operation without removing hand from the wrench.

4.—Ratchet can be used for either right or left hand taps without adjustment.

5.—After tapping operation is completed tap can be spun out of hole by knurled head on upper sleeve instead of backing out hand over hand.

6.—Swivel head permits of tapping for hours without injury to the hand.

7.—By using center in head, tapping can be done in lathe or other machine with accuracy and speed.

8.—Jaws are adjustable and broached square on the inside to insure firm gripping and true chucking.

9.—Wrench is made to limit gauges, very carefully hardened and inspected.

10.—All exposed parts are polished and finished in gun metal to prevent corrosion.

11.—No. 2 and No. 3 Wrenches cover a larger range of sizes than any other wrenches on the market.

12.—The Wrench is *absolutely guaranteed.*

PRICE LIST:

No. 1.	Length over all 3".	Capacity 1-16" to 3-16", $1.25
No. 2.	Length over all 3 3-4".	Capacity 1-8" to 3-8", $1.50
No. 3.	Length over all 5 3-16".	Capacity 3-16" to 1-2", $2.00

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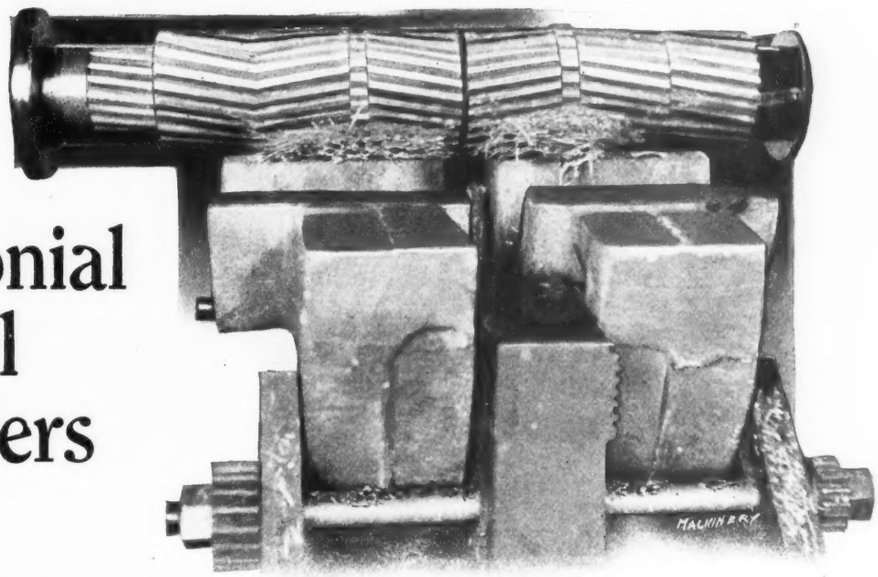


Colonial Steel Cutters are Cutters

Cutters that can be fed at the rate of 1¾ inch per minute upon rough scaly steel castings like those in the photograph are *good cutters.* That is what the cutters shown are doing. They're made of Colonial No. 7 Steel—speed is twenty-five revolutions per minute and it takes fifteen minutes to run across the two castings with the gang of Colonial Steel Cutters.

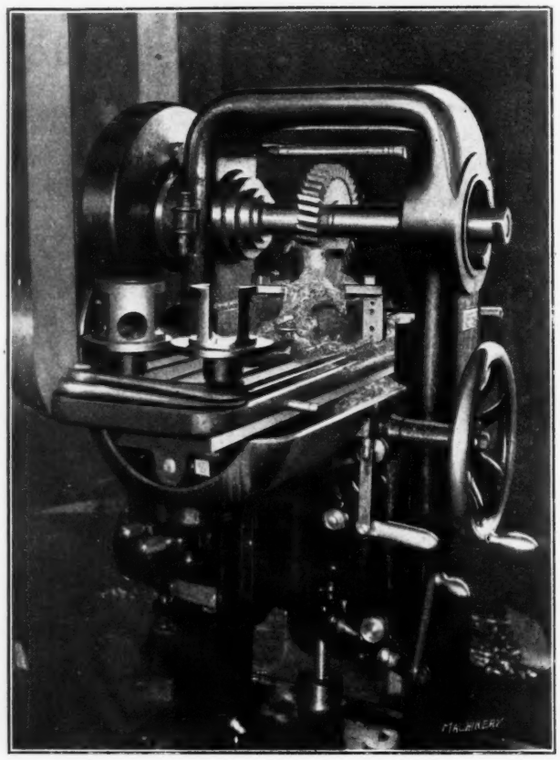
In the factory where these cutters were photographed the exclusive use of **Colonial Steel** for milling cutters, gear cutters, hobs and other special tools, has come about through actual tests of this steel in competition with others for the same purpose.

Colonial Steel will give similar results on your milling cutter work, because it is uniform steel in every respect. Proper heat treatment will give you maximum results on every bar of **Colonial Steel.** One order is the forerunner of a second.

Specify Colonial to save costs. The whole story on request.

COLONIAL STEEL COMPANY

PITTSBURGH NEW YORK BOSTON CHICAGO



A Six-minute Cut on the "BRIGGS"

How's this for six minutes' work—a cut 1½" wide by 2⅜" deep and 3½" long in a nickel steel forging previously prepared by a drilling operation? "Some cutting" is right; but it is the kind of cutting you get when you use "Briggs" High Duty Milling Machines.

Can you use a milling machine that is different—a radical departure from conventional designs—the biggest, strongest little milling machine on the market—a machine which will drive any cutter just as fast and as hard as the cutter and the work can stand?

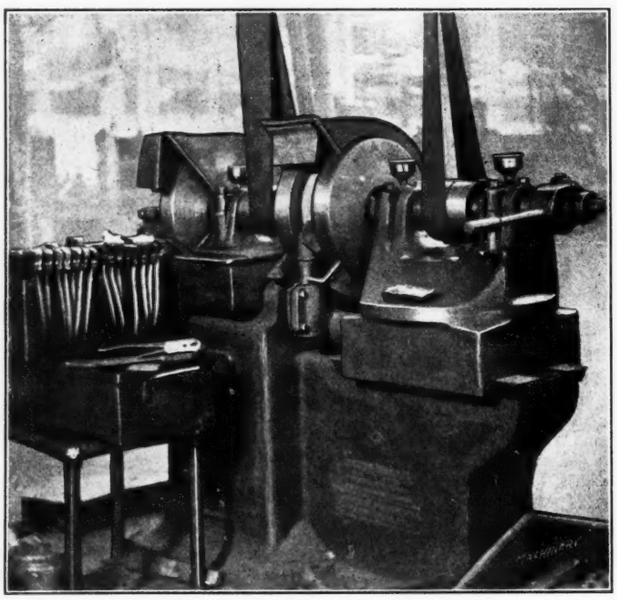
If you think you might find use for it send for the catalogue and more details.

GOOLEY & EDLUND, 581 South Clinton St., SYRACUSE, N. Y.

2000 Pairs of Pliers a Day on the "Diamond"

The Utica Drop Forge and Tool Company at Utica, N. Y., find this Diamond Grinding Machine, equipped with Diamond chucks and emery rings, a time and money saver in grinding both sides of their pliers. It's the hardest kind of work, as the projecting rivet heads and rough faces of the forgings, which are 1⅛ by 3½ inches in size, must be ground smooth and parallel. One man and the "Diamond" turn out 2000 pairs of finished pliers in a day.

Diamond Double-head Disc Grinders are just the machines for facing small parts of all kinds; the work can be sized and finished at the same time, the two surfaces will be perfectly parallel, and pieces will be duplicates.



Two cents may save many dollars; better write today for full details.

THE DIAMOND MACHINE CO., Providence, R. I.

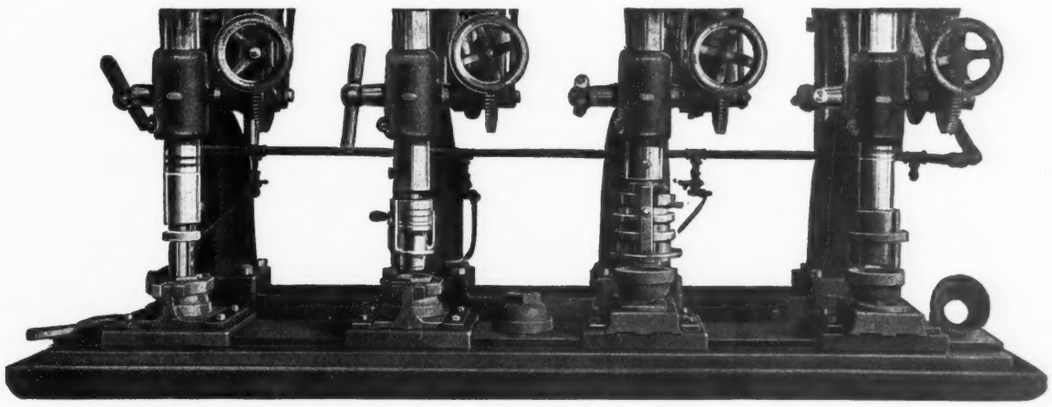
THE ROCKFORD DRILLING MACHINE Co · ROCKFORD · ILL., U.S.A.

How can you best use the operator's spare time? Answer, "More Spindles."

For example, the accompanying illustration shows a 4-spindle 23-inch Rockford Heavy Service Gang Drilling Machine equipped for facing, boring and tapping cylinder caps. The small end of the cap is hexagon shaped.

The cap is placed large end downward in the jig under No. 1 spindle and the jig cover is closed down over it, holding the piece by means of a hexagon opening in the cover, which fits reasonably close over the hexagon end of the cap.

The piece next goes to No. 2 spindle, where it is tapped, collapsible taps being used. It is then screwed onto a taper plug under No. 4 spindle, where the large diameter is bored and faced. The jig is then slid to No. 3 spindle, where the large diameter is tapped, collapsible tap being used.



When the four spindles are working, these operations follow each other in rapid rotation, the operator tapping both the small and large diameters at the same time by pulling down both tapping levers, one with each hand. The Rockford self-centering jig is very essential to the rapidity of these operations.

Production on a cap 5 inches in diameter at the large end and 1½ inches at the small end is 400 per day, and on pieces of smaller diameter it would go up to 500 or 600 per day, on one machine, with one operator.

Is the suggestion worth anything to you? There are more examples in "Jigging and Tooling." Want a copy?

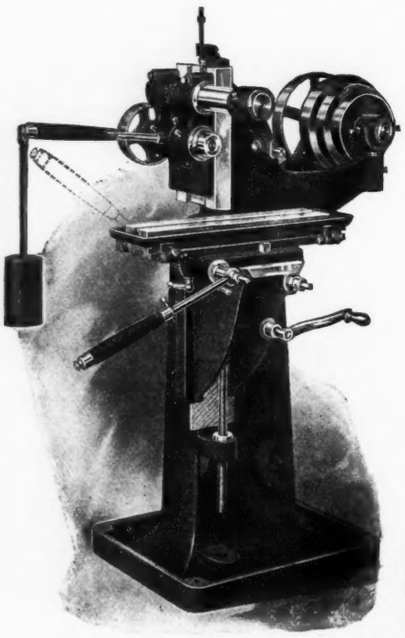
ROCKFORD DRILLING MACHINE COMPANY

ROCKFORD, ILLINOIS, U. S. A.

Edgar Bloxham, Agent for France, Italy and Belgium; Thomas McPherson & Son, Melbourne; Alfred H. Schutte, Agent for Western Germany, Switzerland, Spain and Portugal; R. S. Stokvis & Zonen, Ltd., Rotterdam, Agents for Holland and the Dutch Colonies; Buck & Hickman, Agents for Great Britiain.

For Light Manufacturing Try a "WHITNEY"

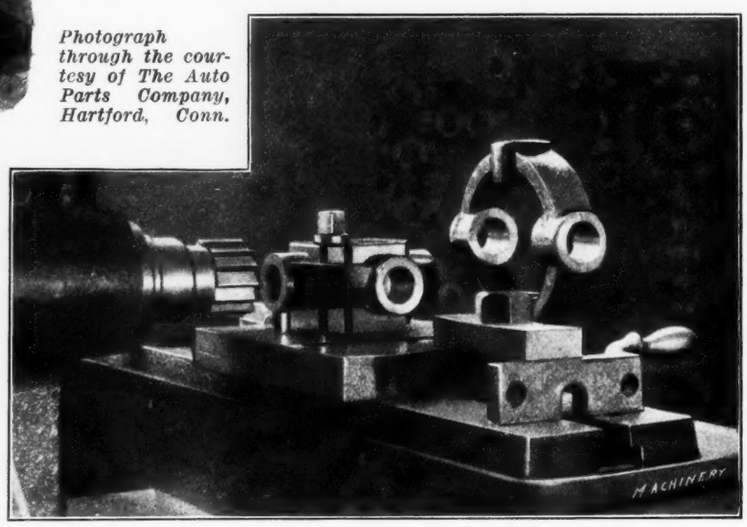
The Whitney Hand and Weight (feed) Milling Machine was designed for taking light cuts on work that can be handled rapidly, and for such work there is no better equipped machine. As for the big power-feed milling machines, they don't compare; their use on light work is excusable only because there isn't enough larger work in the shop to keep them busy.



This example of Whitney efficiency—machining the ends of ring couplings in the plant of the Hartford Auto Parts Company, Hartford, Conn., tells its own story. The amount of metal removed on each of the four faces is about 1-16", and the diameter of the faces is 1 1-2". A boy drops the pieces over the square fixture and the four faces are milled successively. These ring couplings are finished at the rate of 40 per hour, or a total of 160 milled faces in one hour's time—fast work, and good.

If your work can be handled on the Whitney Hand and Weight (feed) Milling Machine it will pay to invest in one. The first cost is not high, and the up-keep is very low. The hand feed is flexible—you can bring the cutter to the work rapidly, slow down when the cut is heavy and increase again when the cut is light. Hand feed gives production — Whitney Millers prove it.

Photograph through the courtesy of The Auto Parts Company, Hartford, Conn.



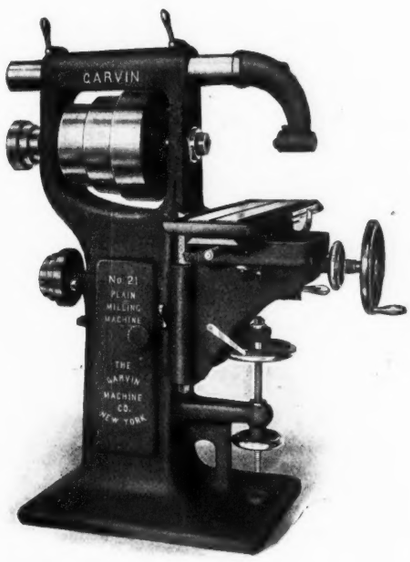
There are other points of advantage described in the catalogue. Send for a copy.

THE WHITNEY MFG. COMPANY

HARTFORD, CONN., U. S. A.

FOREIGN AGENTS: C. W. Burton, Griffiths & Co., London. Fenwick Freres & Co., Paris. F. G. Kretschmer & Co., Frankfurt a/M., Germany.

A GARVIN MILLING MACHINE FOR EVERY NEED



GARVIN No. 21 Plain Milling Machine.
Use Code - - Absorb

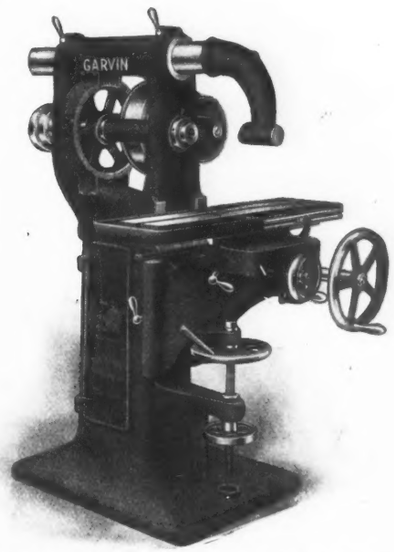
Fully 80% of the Milling Machines manufactured are used on manufacturing work, and a great majority of this 80% is used on what is called long set-ups. Did it ever occur to you that a simple Milling Machine without frills is made just as accurately as the so-called standard machine, and would effect a great saving in the first cost of your machine tool equipment?

Again, a less expensive operator can be used.

Think this over and investigate the merits of our No. 21 and No. 22 Plain Milling Machines—made especially for manufacturing work and used by large concerns in gangs of six, to one operator.

Machines are simple and accurate, having lots of power, and enough feed and speed changes to take care of the work they are intended for.

Ask a GARVIN User.



GARVIN No. 21 Plain Milling Machine, Back-Geared. Use Code - - Abject

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Spring and Varick Streets **45 Years in NEW YORK CITY**

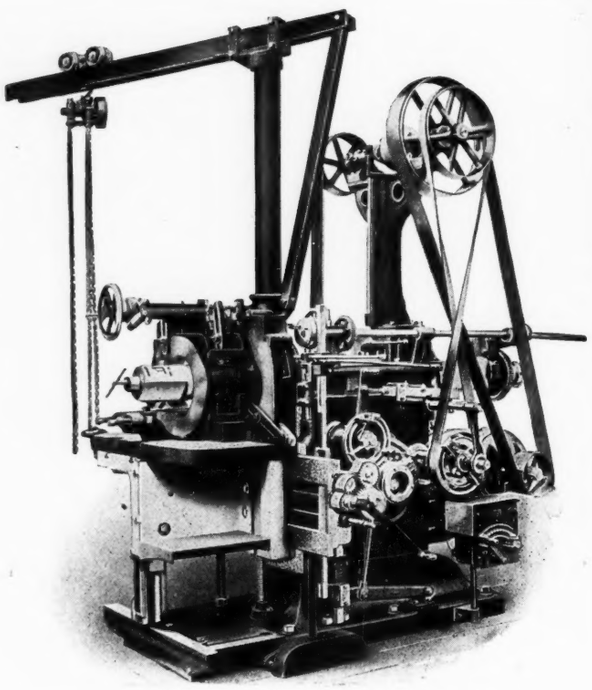
VISITORS WELCOME

The Morton Draw-Cut Railroad Shaper

Built especially for the work. Slots the Crown, and Cellar fits in Axle Boxes better and quicker than a Slotter. Planes the Brass Crown Bearing or Shell to fit. Planes Shoes and Wedges, Rod Brasses, and is well adapted to general work.

Built in one size only—thirty-two inch stroke. Send for Bulletin No. 6. We also build Standard Pillar Shapers of 26 to 30-inch stroke. Bulletins Nos. 4 and 5. Special Shapers for Frog and Crossing work, Bulletin No. 10, and Locomotive Cylinder Planers with full equipment, Bulletin No. 7.

Built by the Draw-Cut Specialists.



Planing the Crown and Cellar fit in Steel Axle Box

The Morton Manufacturing Company
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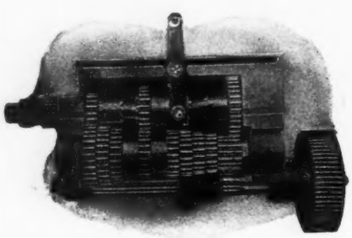
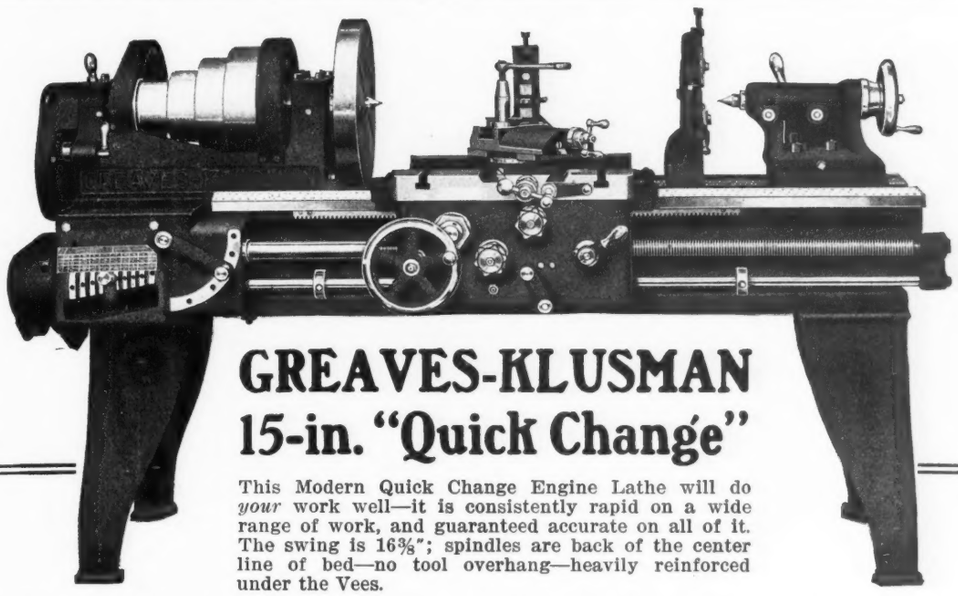
The Flather Quick Change Gear Lathe

Latest and Best.
Strong and Simple.
Least number of Gears.
Greatest number of Threads and Feeds.

Send for descriptive circular.



Flather & Company, Incorporated, Nashua, N. H.



GREAVES-KLUSMAN
15-in. "Quick Change"

This Modern Quick Change Engine Lathe will do *your* work well—it is consistently rapid on a wide range of work, and guaranteed accurate on all of it. The swing is 16⅜"; spindles are back of the center line of bed—no tool overhang—heavily reinforced under the Vees.

The Quick Change Gear Box is of new design; simple and compact; only two handles needed to cut the entire range of threads and feeds.

Every part of a Greaves-Klusman Lathe is as nearly correct as modern methods, backed by the best machine tools, can make it. We solicit your order, knowing that we shall add another friend to our already long list.

Will you write?

GREAVES, KLUSMAN & COMPANY, Cincinnati, Ohio

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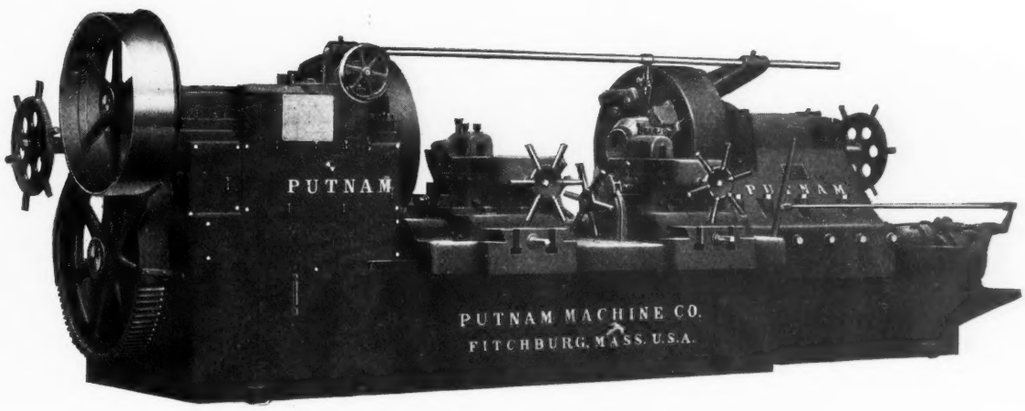

PUTNAM LATEST PATTERN 42" COACH WHEEL LATHE. ALL STEEL GEARING. HEAVIEST AND STRONGEST BUILT. BELT OR MOTOR DRIVEN, AS DESIRED. COMBINATION TOOL HOLDER. PUTNAM DRIVING DOGS. AUTOMATIC TAILSTOCK BINDING DEVICE.

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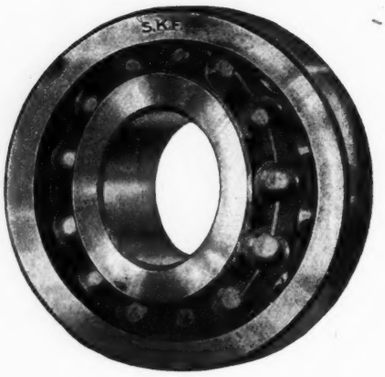
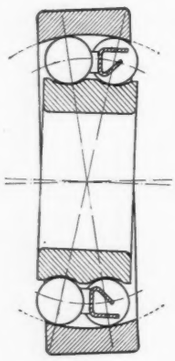
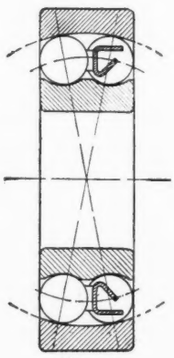


QUICK STARTING


Deflected

Quick starting of a unit means a minimum of friction in the bearing.

It means a saving in the power, because you are not drawing 50 H. P. to get your equipment under way, where you can well enough start it on 25 H.P.


Normal

USE SKF SELF ALIGNING BALL BEARINGS.

They require no more power at starting than they do at full speed.

An ordinary babbitt bearing frequently takes 200% of the normal running power, in starting.

Get strength, simplicity, accuracy, and **Self Alignment** by using

SKF SELF ALIGNING BALL BEARINGS

Self Aligning means the ability of the bearing to adjust itself and yield to deflection from any cause, a bend in the shaft or distortion in the machine frame.

Consult our engineers on special applications.
Write for our literature.

SKF BALL BEARING CO.

50 Church Street, New York

608 South Dearborn Street, Chicago.

Now He Knows

But if he had known sooner he would have saved his firm many dollars. Why? Well, this grinder was the only one in the shop. More and more work was put upon it. No one had taken the trouble to find out if it was running up to speed. Then this machinist came to the shop. He had a little instrument in his kit that had cost him only $1.50. With it he took the speed of the grinder. *It was running at only two-thirds of the rated speed.* The machine was speeded up and the cost of a new grinder was soon saved. Pretty good, wasn't it? Oh—the instrument? It was a

Starrett Speed Indicator

It is a nicely finished reliable instrument with all working parts enclosed like a watch. It will record the highest speeds without heating. All sorts of uses for it will occur to you, such as speed tests on line shafting, grinders, buffers, emery wheels, engines, turbines, gas engines, motors, fans, etc. The indicator is furnished with rubber tips for centered or square end shafting.

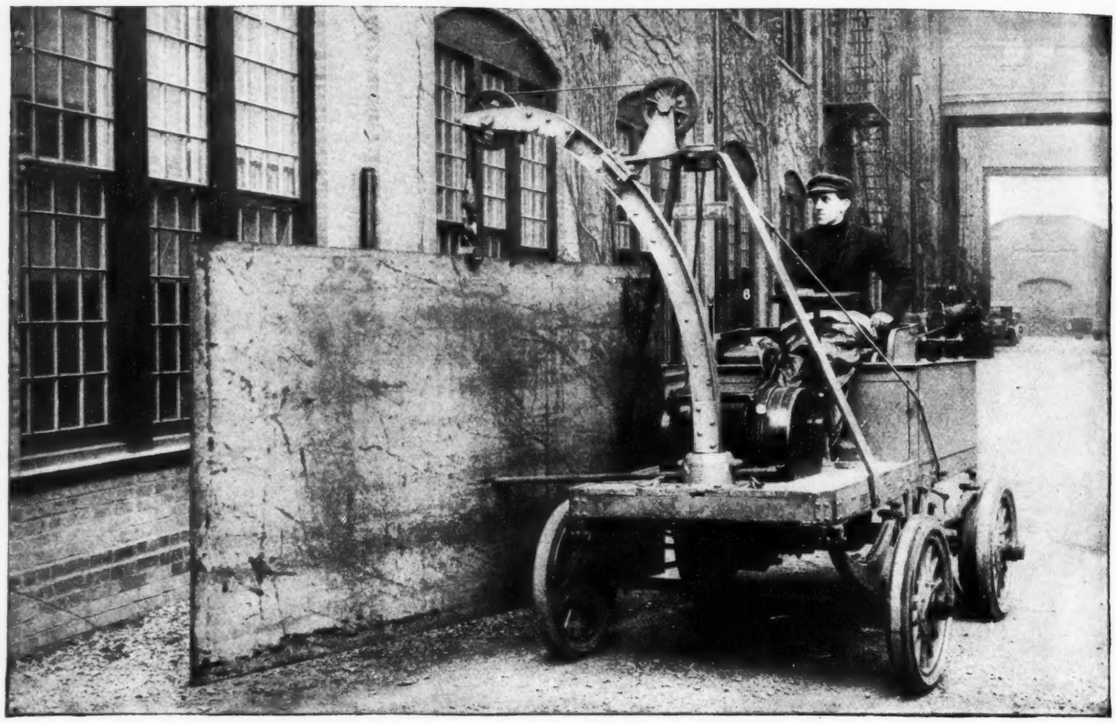
Made in three styles to suit all needs for counting and registering speeds.

Let us send you catalogue 19D describing the various styles, or have your hardware dealer show you one.

The L. S. Starrett Co.

Athol, Mass.

42-179



Battery Truck Crane Carrying 1,100 Lb. Boiler Plate—one-half its capacity.

Inconveniently Shaped Parts Are Quickly Handled by Battery Truck Crane

We all know how inconvenient it is to handle or carry boiler plates. The battery truck crane is an automobile derrick which is most suitable for handling inconveniently shaped parts.

One machine will lift, carry 300 ft. and place thirty 1-ton castings in an hour.

Heavy material, usually requiring the use of rollers and tripods, was carried into the G-E exhibit at the M. C. B. and M. M. conventions and placed in position by the Battery Truck Crane.

General Electric Company

Largest Electrical Manufacturer in the World
General Office: Schenectady, N. Y.
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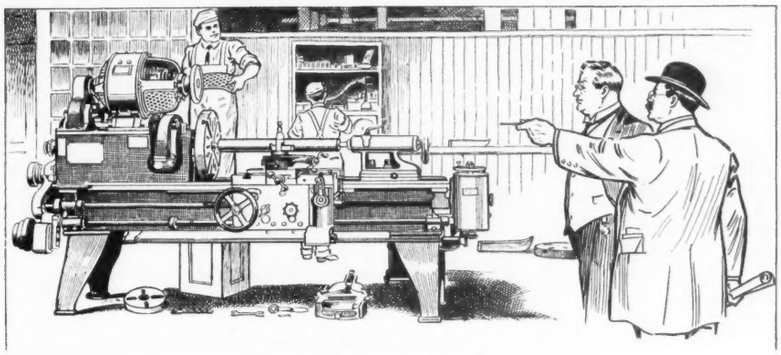
For Texas, Oklahoma and Arizona business refer to Southwest General Electric Company (formerly Hobson Electric Co.)—Dallas, El Paso, Houston and Oklahoma City. For Canadian business refer to Canadian General Electric Company, Ltd., Toronto, Ont.

(7) 4247

Why the Man Who Knows Specifies Westinghouse Motors



"Look at that commutator!"

"JOHN," said the manager to the superintendent, "why do you like Westinghouse motors so well that you always specify them when we want new equipment?"

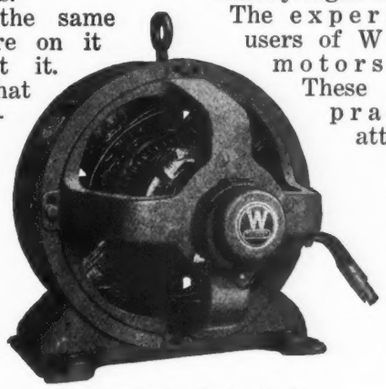
"Well, sir," said John, "there are several reasons, but the main one is that they do their work and give me no trouble.

"There is one on that lathe. It's been running over two years and I haven't had to do a thing to it but look it over occasionally and renew the oil in the oil wells three or four times.

"It still has the same brushes that were on it when we bought it. Now, you know what commutator troubles are; there hasn't been a sign of one with this motor.

"Look at that commutator! Hardly shows a bit of wear, but I have had to turn down the commutators of some of our other motors twice in two years. Why, I never saw a spark on that commutator, no matter what we were doing on the machine, and I can say the same of every type SK Westinghouse motor we have in the shop.

"Another thing. The brush position is fixed. You don't need to change it and can't if you want to. Take some of our other motors; you have to adjust the brushes every time you change the kind of work on the machines, and if you don't do it exactly right there's trouble."



Direct current motor for Machine Tool service

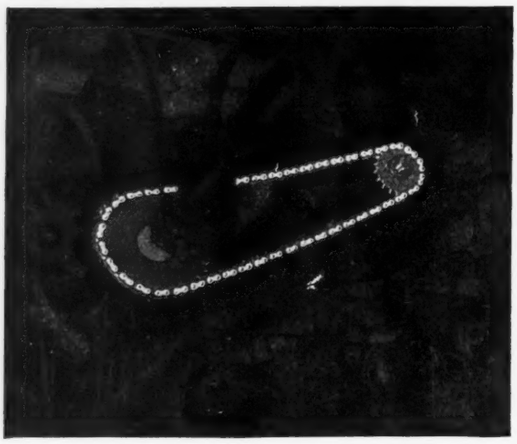
The experience of other users of Westinghouse motors is the same. These motors require practically no attention beyond inspection and lubrication, and their commutation is excellent, even under the severest overloads.

Write Dept. 44 for full information on these motors.

Westinghouse Electric and Mfg. Co.

East Pittsburgh, Pa.

Sales Offices in 45 American Cities



Consider Advantages of Chain Drives in Your Plant

The Diamond Chain Drive shown is one of a group of five drives. Each one transmits 7½ horsepower to twenty automatic screw machines in our factory.

Speed of motor shafts, 825 R. P. M. Speeds of line shafts range from 160 R. P. M. to 436 R. P. M. Sprockets on motor shafts have 19 teeth. Speed of chains for the five drives varies from 903 feet to 313 feet per minute; maximum pull of chain 180 pounds to 274 pounds.

This department is one of the busiest in our plant, operating every working day in the year and in rush seasons twenty-four hours a day. Chains have been in use four years and are today giving perfect service. We could not have secured equal advantages and economies from any other form of transmission.

Perhaps you have some drive on which Diamond Chains could be used to equal advantage. If you wish advice or a recommendation on your requirements our engineering department is at your service.

Write for our treatise "Power Chains and Sprockets"—a book of reference equally valuable to engineer, designer and shop manager.

Diamond Chain & Mfg. Company
240 W. Georgia St., INDIANAPOLIS, IND.
Capacity 8,000,000 feet per year

Loose Pulleys Should Be Mounted On Rhineland Ball Bearings

The substitution of Rhineland Bearings for plain bearings on countershaft pulleys or wherever a belt runs part time on a loose pulley soon saves enough power to make the change profitable. Besides this, the greatly decreased starting and operating friction protects the belts from jerks in switching and the lubrication problem is solved. A much smaller amount of lubricant and attention keeps the bearings highly efficient and there is no need of using a thin oil that may reach the belts and get slung from the pulley spokes.

Loose pulleys mounted upon Rhineland Bearings are less apt to cause belt slip and the accidental shifting that in many instances are dangerous to workmen.

If you have loose pulleys on machines in your shop or that you manufacture, it will pay you to talk this matter over with us.

RHINELAND
Machine Works Co.
140 West 42nd Street New York City

Offices, agencies and supply depots in principal manufacturing centers throughout the United States.

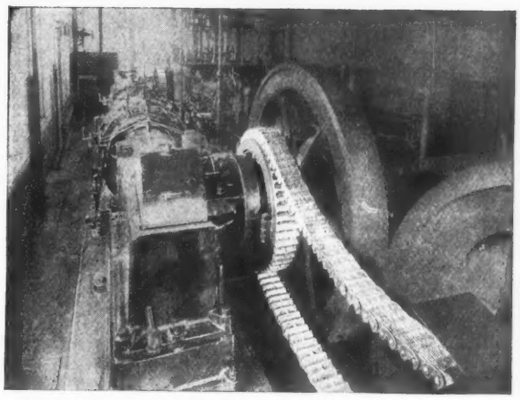
Morse Silent Chains

mean *better* power transmission

YOUR problem, whether for one machine or a dozen, is more a question of "how much is now lost" than "how much can be gained" by changing to some other system.

It's a dollars and cents question of how long you **can afford** to "stand pat" on your present transmission.

Will you let us submit figures based on your conditions and requirements? We guarantee to show you where **it will pay to change to MORSE Silent Chain Drives. Write us today.**



85 H. P. Morse Silent Chain Drive from Gas Engine to Compressor

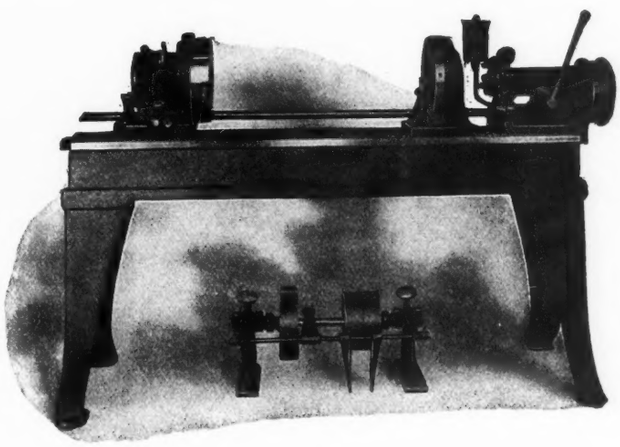
Morse Chain Company, Ithaca, N.Y.

A-86

THE WHITON

REVOLVING CENTERING MACHINE

FOR ACCURATELY CENTERING FINISHED SHAFTS



The cut shows new **Revolving Centering Machine**—a large size of the well known machine of this type. It is heavier throughout and has capacity to center shafts up to 5 inches in diameter.

Constructed same as the smaller machine and embodies all the special features.

Circulars and prices sent upon application.

THE D. E. WHITON MACHINE COMPANY

NEW LONDON **CONNECTICUT, U. S. A.**

Taft-Peirce Service

is the modern, time saving, worry eliminating method for making special tools, developing ideas, manufacturing machines - A strictly *contract proposition* for producing manufactured articles of wide diversity and purpose.

Taft-Peirce Service

combines all the essentials of modern manufacturing—foundry, factory and shop: equipment, engineering staff and experience: men, knowledge and skill. It is "Service" of the highest order at costs lower in some cases than can be reached by other means or methods.

Jigs and Fixtures

Let us tell you what our Tool Making Department for instance, could do in designing and making dies, jigs, fixtures, patterns, etc., for your special purposes.

We'll be glad to answer questions, or to send a representative. The new Booklet will give you an idea of our facilities and shows some of the work we have done.

The Taft-Peirce Manufacturing Co.

Woonsocket Rhode Island

New York . 165 Broadway Detroit: 1311 Majestic Bldg

Chicago: 1038 National Life Bldg

MACHINERY

AN ALOXITE WHEEL

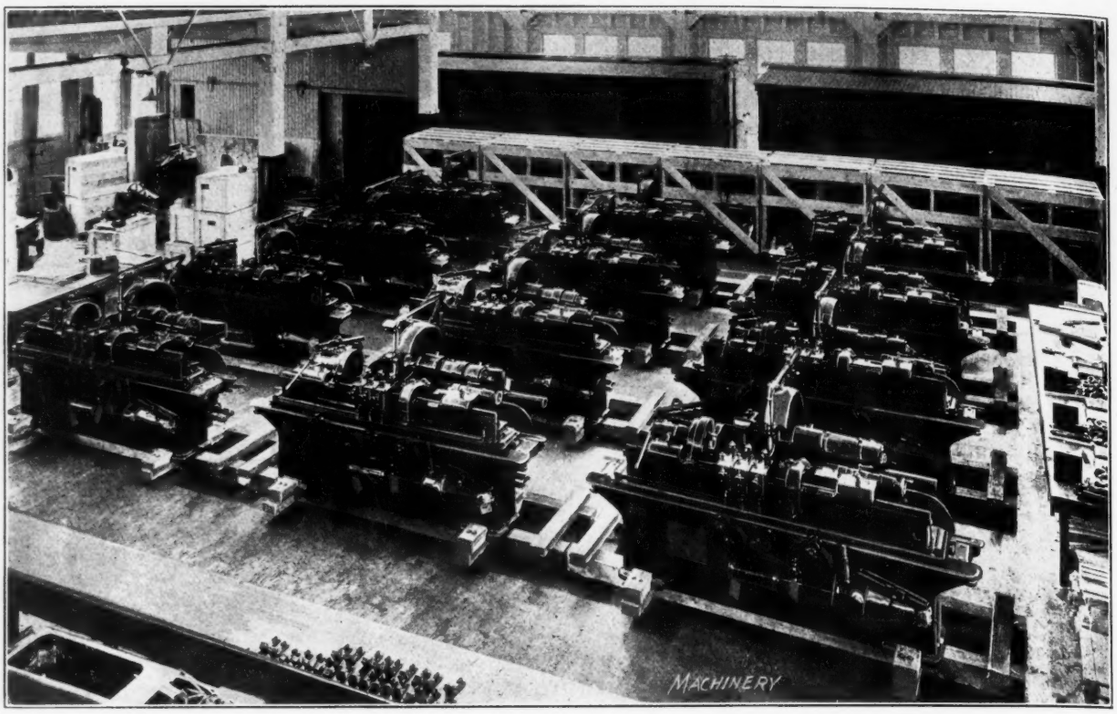
Roughs and Finishes a 1⅝-inch Steel Shaft 32 inches long in thirty minutes

THIS is another example of the splendid work being done on steel cylindrical grinding by the Aloxite Wheel—clean, fast, cool, cutting without chattering—an ability to hold its shape and stand up to the work—and the economy of long life—make it possible for the Aloxite Wheel to make such splendid records. The shafts are 32 inches long, 1⅝-inch diameter, made from 40-point carbon steel—each shaft has three hardened bearing surfaces—the same wheel roughs and finishes the whole shaft—hardened surfaces and all—in thirty minutes—fifteen thousandths are removed in roughing, two thousandths in finishing.

SUCH RESULTS COME FROM USING—THE RIGHT WHEEL IN THE RIGHT PLACE

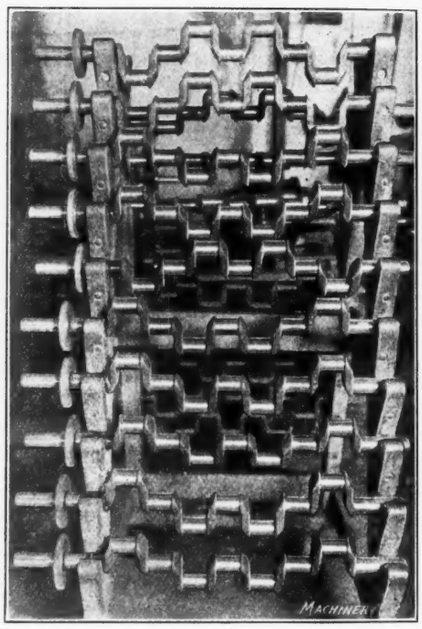
THE CARBORUNDUM COMPANY
NIAGARA FALLS, N. Y.

NEW YORK CHICAGO BOSTON PHILADELPHIA CLEVELAND CINCINNATI
PITTSBURGH MILWAUKEE LONDON, ENG.



NORTON GRINDING MACHINES

A Shipment to One of the Large Automobile Plants



These Norton Grinding Machines—twelve 14"x50" machines in the foreground and seven 6"x32" machines in crates—are now part of the equipment of over 60 Norton Cylindrical Grinding Machines in a big Western automobile shop, where a wide range of work is finished by grinding.

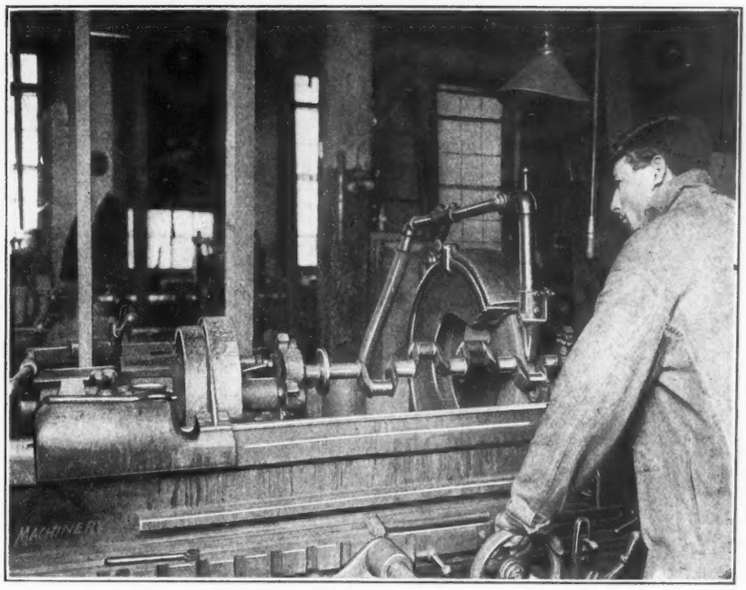
Crank shaft grinding is a good example of their work—work which, up to a comparatively short time ago, it was not

NORTON GRINDING COMPANY,

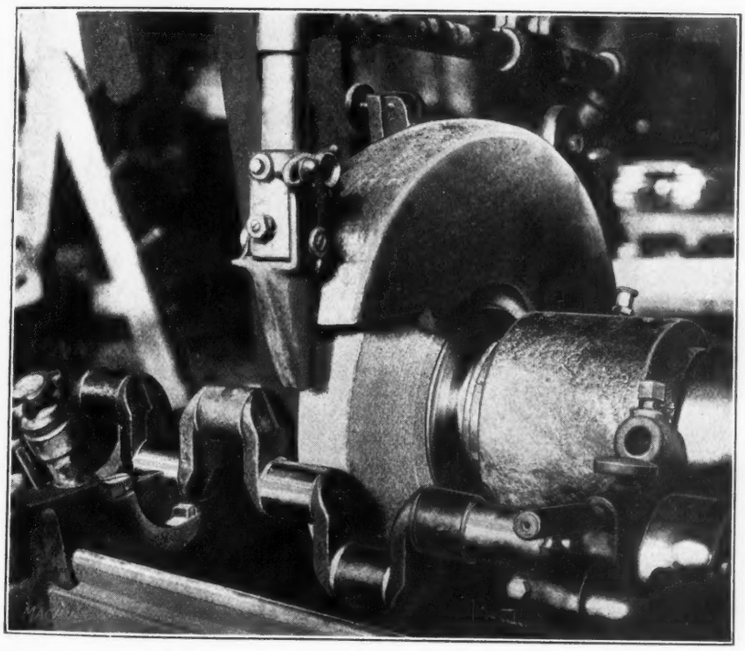
CHICAGO STORE, 11

AGENTS: Vonnegut Machinery Co., Indianapolis. Robinson, Cary & Sands Co., St. Paul and Duluth. Manning, Maxwell & Moore, Inc., St. Louis. The Motch & Merryweather Mchy. Co., Cleveland, Pittsburgh, Cincinnati and Detroit. Eccles & Smith Company, San Francisco, Portland, Ore., and Los Angeles. Prentiss Tool & Supply Co., New York, Boston, Rochester, Buffalo, Syracuse and Scranton. Canadian

thought possible to grind economically. The Norton Machine has demonstrated its efficiency on this class of production — the 14" x 50" machines, shown herewith, being used largely for this purpose.



Before coming to the "Norton" for the roughing of the crank pins, the five bearings are rough ground on another Norton Machine—the forgings coming from the heat treating plant to the grinding machines direct, with the exception of a simple operation—facing the sides of the crank arms, in a crankshaft lathe—so that the grinding wheel, which is the exact width of the crank pin or bearing, can enter. The wheel is fed directly into the work until the roughing diameter is reached, in this case 1.525", the 0.025" being left for finish grinding.



Grinding crank shafts from the rough is only one class of work which Norton Cylindrical Grinding Machines handle economically.

Let us show you.

Worcester, Massachusetts, U. S. A.

NO. JEFFERSON STREET

Fairbanks-Morse Co., Montreal, Toronto, Winnipeg and Vancouver. Alfred Herbert, Ltd., Coventry, England, Paris and Milan. Schuchardt & Schutte, Vienna, Prague, Budapest, St. Petersburg and Stockholm. F. W. Horne, Tokio, Japan.

250 N

FOREIGN REPRESENTATIVES:

Schuchardt & Schutte Stockholm, Berlin, Vienna, St. Petersburg, Copenhagen, Budapest.

Alfred H. Schutte, Cologne, Brussels, Paris, Milan, Bilbao, Barcelona.

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Chas. Churchill & Co. London, Birmingham, Manchester, Newcastle-on-Tyne and Glasgow.

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Hallidie Mchy. Co., Seattle, Spokane, Tacoma, Wash.

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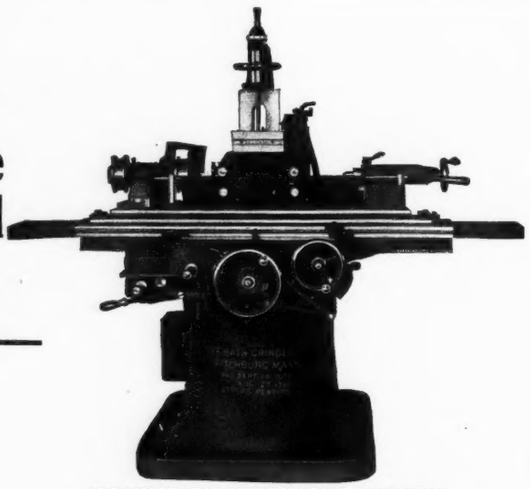
Vandyck-Churchill Co. New Haven, Conn., Philadelphia, Pa.

Industrial Equipment Co. Atlanta, Ga.

A. R. Williams Mchy. Co. Toronto, Can.

The Heaviest Complete Universal Grinding Machine—the "Bath"



ARRANGED FOR CYLINDRICAL GRINDING

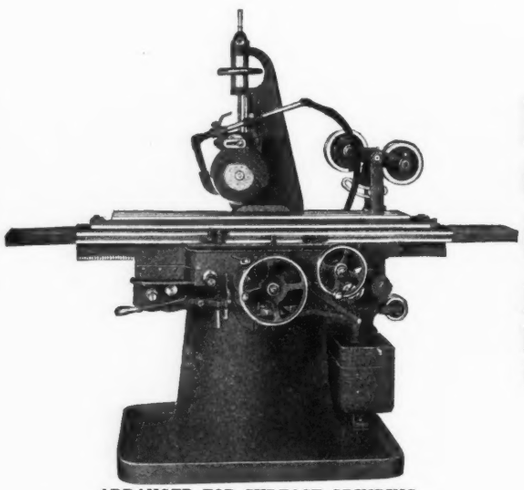
The Bath Universal is the heaviest Complete Universal Grinding Machine on the market, entirely new in design, and as rapid and accurate on all the work it handles as any single purpose machine is on part of it. These are strong claims; but the Bath is a strong machine, and has proved them over and over again.

We'd like to demonstrate this grinder to you—show you why it will pay a bigger return on the investment than almost any machine or tool you can install—why the unusual features of Bath design and construction give unequalled range and production capacity.

We invite particular attention to the massive proportions of the bed, column, knee, etc., the wide range of work and traverse speeds, liberal bearings, the accuracy of automatic feeds, the location of all operating wheels and levers at front of table, etc.

Write us. We maintain a Service Department, with grinding experts at your command on any problem.

Catalogue and specifications on request.

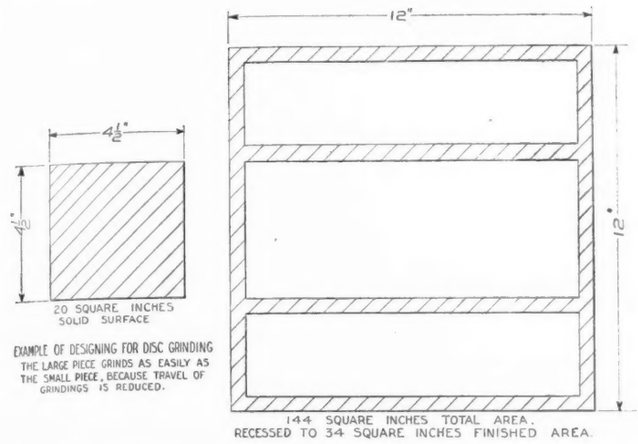


ARRANGED FOR SURFACE GRINDING

Bath Grinder Company

Fitchburg, Massachusetts, U. S. A.

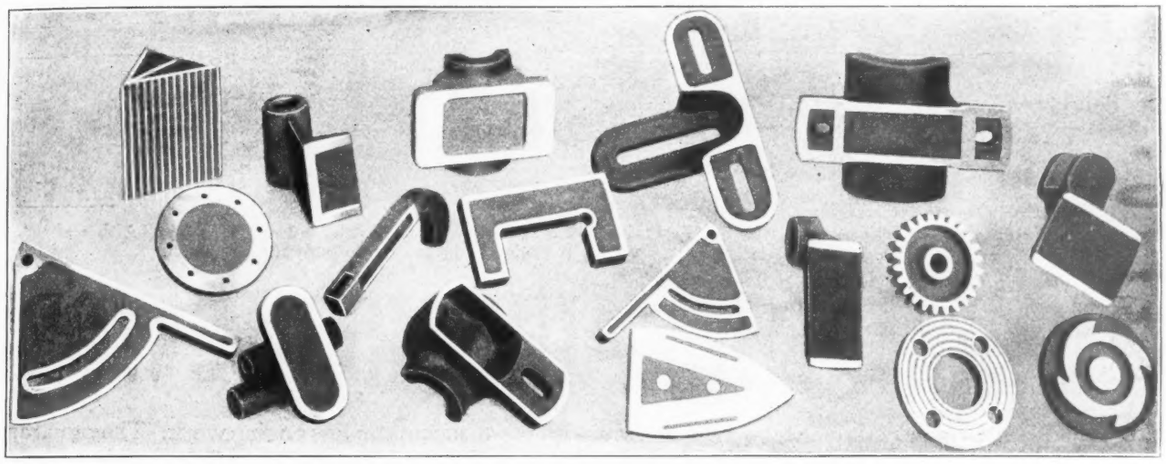
DESIGN YOUR WORK TO BE BESLY GROUND


12"
4½"
4½"
12"
20 SQUARE INCHES SOLID SURFACE
EXAMPLE OF DESIGNING FOR DISC GRINDING
THE LARGE PIECE GRINDS AS EASILY AS THE SMALL PIECE, BECAUSE TRAVEL OF GRINDINGS IS REDUCED.
144 SQUARE INCHES TOTAL AREA.
RECESSED TO 34 SQUARE INCHES FINISHED AREA

Designers who are up on modern disc grinding practice are often able to make slight changes in the design of surfaces so as to bring the work within the capacity of disc grinders, thereby making *wonderful reductions in manufacturing costs.*

Most of the heat generated in disc grinding is from friction caused by grindings (or ground particles) rolling between circle and the work. The greater the distance these grindings are carried between circle and work before being discharged, the greater the friction and heat generated. Excessive travel of grindings is the principal cause of heat and, therefore, *the distance traveled by grindings before being discharged from circle is one of the most important considerations in disc grinding.*

Where a surface is broken by indentations into which the grindings discharge, less heat is generated because travel of grindings is reduced.



Examples of work recessed to reduce travel of grindings. Scale, 1½" = 12".

We cannot too strongly emphasize the importance of cutting away, wherever possible, all finished surface area which is not necessary for bearing points.

Even on small work such action will reduce cost of grinding by saving in wear on circles and in time of grinding, and by applying this principle of recessing patterns on large work the field for the Besly Grinder is greatly extended, as large work can be brought within the capacity of Besly Grinders which otherwise would have to be surfaced by other methods at much greater cost of manufacture.

On many machine parts enough metal is saved by recessing patterns to more than pay for the machine work; so the finished work, "Besly Ground," costs less than the rough casting formerly used.

(*Extracts from Besly's Modern Disc Grinding Practice.*)

Increase production two to twenty times.
Reduce manufacturing cost 50 per cent to 90 per cent.
On many pieces save enough metal to pay for machine work.

A STORY WITH A MORAL

A manufacturer of wood working machinery recently hired a new superintendent—a young, clear-headed, nervy man who wasn't "in a rut." One of the first things this new superintendent did was to rig up the Besly Grinder with simple holding fixtures for the Geared Lever Feed Worktable, and have patterns for their machinery parts changed over and recessed for Besly Grinding instead of milling, planing, shaping, etc.

Result? He showed savings as high as 85 per cent of former cost.

In telling about this, the General Manager said: "I'm mighty glad to see these savings, but it makes me awful sore to think of the money we threw away on that work before we knew how to use our Besly Grinder."

A Postal brings "BESLY'S MODERN DISC GRINDING PRACTICE," 112 pages, 103 pictures.

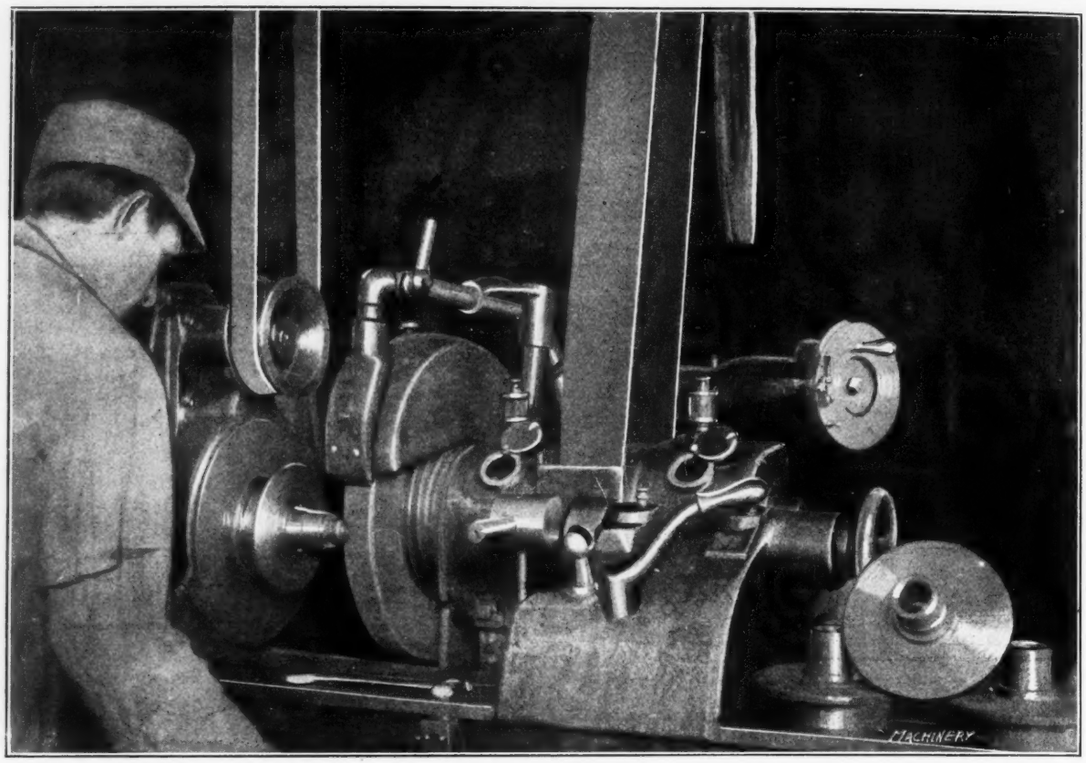
WRITE NOW!

CHARLES H. BESLY & COMPANY

CHICAGO U. S. A.

Largest Manufacturers of Disc Grinders in the World

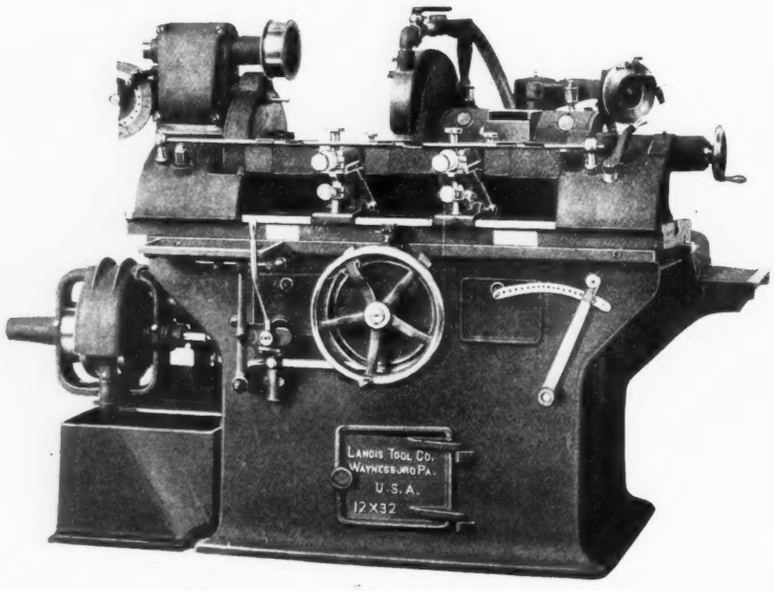
Registered Trade Mark. Registered Trade Mark.



Grinding automobile parts on the Landis Plain Grinding Machine—work held to limits of 0.0005 inch and produced in quantities, fast even for this highly developed manufacturing field.

LANDIS FOR AUTOMOBILE WORK

Landis Plain Grinding Machines are being used with great success on gas engine work. They guarantee accuracy of product and ease and rapidity of handling. Consider Landis Plain Grinding Machines for handling line bearings of crank shafts, cam shaft bearings, valves, (straight portion) pump rods, pistons, piston rings, transmission shafts, axles, etc. Landis Crank Grinding Machine for single and multiple throw crank shafts. Landis Internal Grinding Machine for transmission and differential gears, piston pin bushings, etc. Landis Universal Grinding Machine for valves (straight and taper portions) magnetos, piston rings (face ground), tools, jigs, bushings, etc. Landis Cam Grinding Machines for both detachable and internal cams.



Our catalogue will tell you all about these machines or special circulars for each type and size of machine.

LANDIS TOOL CO.

MAIN OFFICE AND WORKS
WAYNESBORO, PA., U.S.A.

New York Office: Fulton Building, 50 Church St., Walter H. Foster Co., Mgrs.

AGENTS: Dewstoe Machine Tool Co., Birmingham, Ala. Harron, Rickard & McCone, San Francisco and Los Angeles. C. W. Burton, Griffiths & Co., London and Glasgow. Alfred H. Schutte, Cologne, Berlin, Brussels, St. Petersburg, Milan, Paris, Barcelona and Bilbao. Donauwerk Ernst Krause & Co., Wien, Prague and Budapest. A. R. Williams Machinery Co., Toronto. Williams & Wilson, Montreal, Canada. Andrews & George, Yokohama, Japan. M. Buarque & Co., Rio de Janeiro, Brazil.

Grinding rough turned three-step cone pulleys, two at a time, and putting in the crowning at the same time. The machine is the Landis Plain Grinding Machine—productive, accurate and economical.

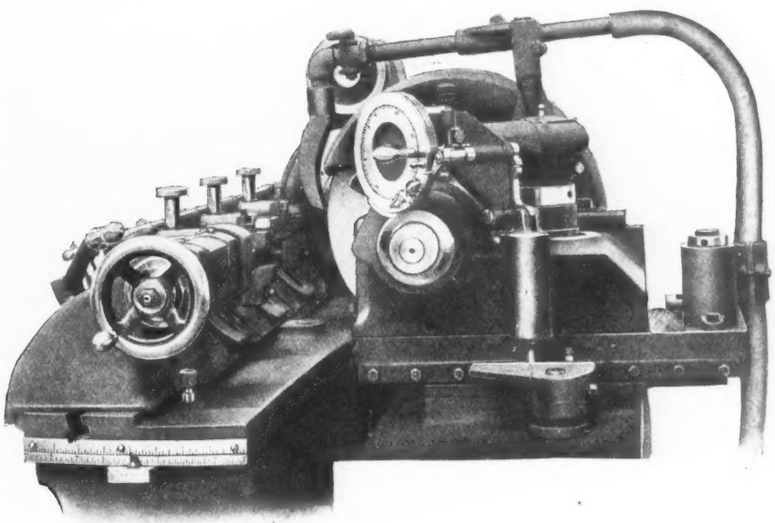
LANDIS FOR MANUFACTURING

Landis Grinding Machines have every convenience for finishing work accurately and rapidly. Bed of machine rigidly constructed and thoroughly webbed. Grinding wheel spindle is large and accurately ground and runs in bronze bearings which have taper adjustments. Surfaces upon which alignments are dependent are chilled. Wheel centers are interchangeable. Speeds of work and traverse are many and regulated independently. Reversing mechanism is positive and quickly adjusted by sliding two dogs. The footstock spindle is quickly operated by a hand wheel—which supports the center to the work either rigidly or with a tension. All levers are operated from one position in front of the machine. Ample circulation of clean water.

AUTOMATIC FEED OF GRINDING WHEEL

The grinding wheel feeding mechanism on the LANDIS is located at the most convenient position for the operator to watch it, while hand feeding the wheel to the work, and it cannot be moved accidently by coming in contact with the body of the operator while he is examining the work.

It has a sizing device which stops automatically when work is reduced to diameter for which it is set. This permits the operator to prepare work for the succeeding operation.



American Grinding Wheels

15 5-7% Increase in Production

ONE "AMERICAN" WHEEL EQUAL IN DURABILITY TO TWELVE GRINDSTONES

$18.00 Saved in Mounting Alone

A recent test in the shops of a large manufacturer of cotton mill machinery (name on request) again proves the superiority of AMERICAN wheels, and further proves the saving that can be made by the adoption of AMERICAN grinding wheels by those manufacturers who still use grindstones for manufacturing grinding operations.

Corundum Wheels
Carbolite Wheels
Emery Wheels

Processes:
VITRIFIED
SILICATE
ELASTIC

For Every Grinding Operation

A 36 x 3 x 21" No. 30 grade 4 W AMERICAN Corundum wheel was tested in competition with a 48 x 3" grindstone.

OPERATION: Roughing soft steel spindles, wet. Spindles run from 7/8" diameter and 36" long to smaller sizes. Stock removed .010 to .015".

The performance for an average two-hour period was as follows:

42" grindstone at 4407 surface feet per minute ground 70 spindles in two hours. Wear of stone 13/64" in diameter.

36" AMERICAN Corundum wheel at 5600 surface feet per minute ground 81 spindles in two hours.
Wear of wheel 1/64" in diameter.

In addition to increasing the production 15 5/7%, one AMERICAN Corundum wheel was equal in durability to 12 grindstones.

The mounting and "racing" (truing) of the grindstones cost $1.50 per stone. $18.00 saved on the item of mounting alone.

We can save money in YOUR shop on YOUR grinding operations. We manufacture every size, shape, grain and grade of grinding wheels, of a variety of abrasives, for all operations. *May we send YOU a trial wheel?*

AMERICAN EMERY WHEEL WORKS

PROVIDENCE, R. I., U. S. A.

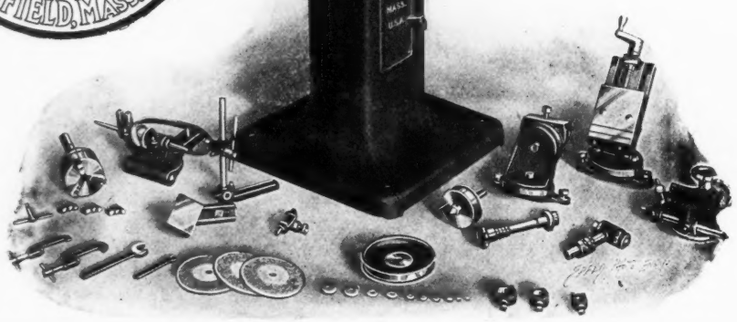
Buck & Hickman, Ltd., London, Sheffield, Birmingham, Manchester, Glasgow; Fenwick Freres & Co., Paris, Brussels, Liege; F. G. Kretschmer & Co., Frankfurt a/M., Germany; Heinrich Dreyer, Berlin, Germany; Hans Schulze, Vienna, Austria; Kann & Heller, Budapest, Hungary; A. B. V. Lowener, Stockholm, Sweden; V. Lowener, Copenhagen, Denmark; V. Lowener's Maskinforretning, Sverre Mohn, Christiania, Norway; R. S. Stokvis & Zonen, Ltd., Rotterdam, Holland; Takata & Co., Tokio, Japan; Societa Italiana De Fries & Co., Milano, Italy; La Maquinaria Anglo-Americana R. D'Aulignac, Barcelona, Spain; Bevan & Edwards, Pty., Ltd., Melbourne, Australia; O. R. San Galli, St. Petersburg, Russia.

"A Friend in Need"

$100.00 for the No. 184 Plain Grinder

This illustration shows No. 190 Universal Grinder. Price $180.

The Wells Grinding Machine is a friend indeed when it comes to variety of work, accuracy of result and speed of production. It takes work up to eight inches diameter and sixteen inches long, and has many practical time and labor saving advantages. The Rack Table Feed, Swivel Bearings, Spring Center and Locking Collar are prominent features. The various attachments to Wells Grinding Machines adapt them to any kind of grinding work. Put a "Wells" in your shop and do away with grinding troubles.



A new catalogue will be sent if you'll write for it.

F. E. WELLS & SON COMPANY

GREENFIELD, MASS. U. S. A.

GRINDING IS CHEAPER

than milling on these fuel pump brackets for oil engines. The surface must make an **air-tight joint.** Following are the results obtained:

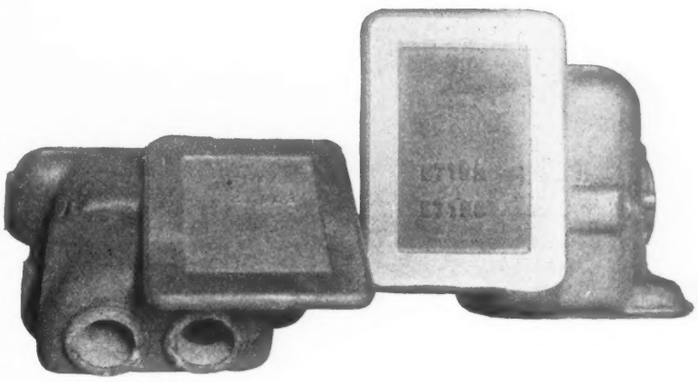
Milling, *20 minutes* per piece.

Grinding, *4 1-2 minutes* per piece.

Handling time same for both methods.

Surface, 8½″ x 6¾″ over all, 1⅛″ wide, ⅛″ stock to remove.

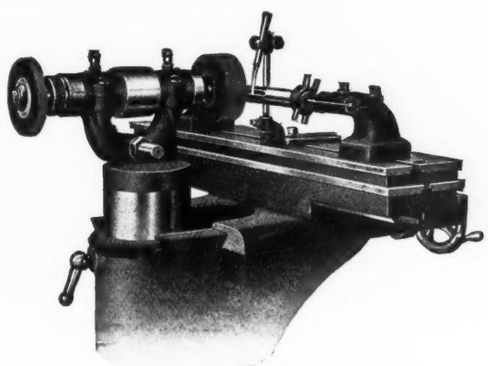
Note that these pieces were ground *from the rough in one operation.*

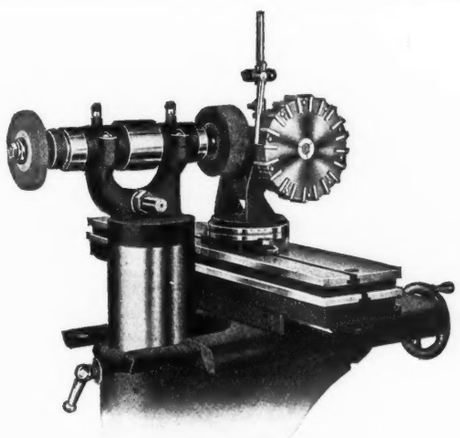


May we show you what the Blanchard Grinder will do on your work?

THE BLANCHARD MACHINE COMPANY
64 STATE STREET CAMBRIDGE, MASS.

AGENTS: Prentiss Tool & Supply Co., Motch & Merryweather Machinery Co., Marshall & Huschart Machinery Co., Kemp Machinery Co., W. E. Shipley Machinery Co., Williams & Wilson, C. W. Burton, Griffiths & Co., Alfred H. Schutte, Schuchardt & Schutte.





Tool Sharpening

has a very important bearing on your productive costs, for the best machinery ever built will fail to show results if the small tool equipment is not accurately sharpened.

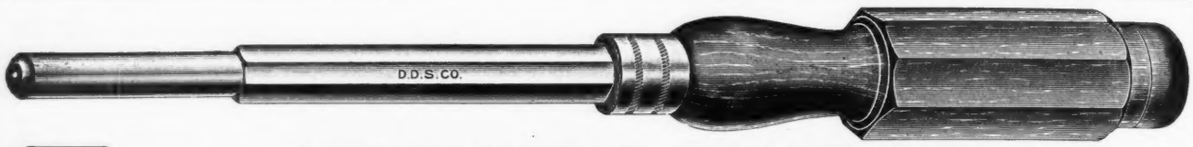
The Greenfield

Universal Grinder

will grind all shapes of Milling Cutters, Reamers, Counterbores and other machine shop tools. With it are furnished a large assortment of Attachments for accurately and conveniently handling such work.

We issue a catalog showing over 20 "set ups" of these Attachments. We will gladly send a copy to any one interested in the latest and best methods of Tool Room Grinding.

Greenfield Machine Company
Greenfield, Mass., U. S. A.



DETROIT DIAMONDS CUT RAPIDLY AND STAY SET

We select the best diamonds procurable for Detroit Diamond Tools, shape them just right for the work intended, and set them by a method which makes it practically impossible for them to work loose and come out. We guarantee all settings to *hold*—all tools to be satisfactory.

For cutting and truing hard steel, phosphor bronze, fibre, mica, etc., and other hard, brittle and gritty material, Detroit Diamond Tools are unequalled. Also for truing and dressing abrasive wheels of all makes and materials. Prices and other information on request.

DETROIT DIAMOND SETTING CO., Detroit, Mich.
Phone, Cherry 2590 R. **406 Jefferson Avenue, East**

Grinding Machines

Different Styles and Sizes for Floor and Bench.

EMERY WHEEL DRESSERS

No. 1 For Regular Shop Use

No. 2 For Large Wheels

These Dressers in connection with our Cutters make a most powerful and efficient tool especially our No. 2 which is made proportionately larger and stronger for large wheels.

CUTTERS

We make the regular "Huntington" (pattern) Paragon Cutter and Roughing Cutter for Dresser No. 1, and the "Huntington" (pattern) and Roughing Cutters for Dresser No. 2.

Let us send you descriptive circular and prices.

GEO. H. CALDER, Lancaster, Pa., U. S. A.

AT OUR EXPENSE

No. 1—½ x ¾ x 10 inches long, $3.50. No. 2—⅜ x ⅝ x 8 inches long, $3.00. No. 3—¼ x ½ x 7 inches long, $2.50.

We will send you one of our Star Carbon Emery Wheel Dressers on ten days trial; if it does not prove more lasting and do better work than any similar dresser you have used, return it at our expense. Send for circular which will explain.

C. H. STEPHAN MFG. CO., Springfield, Ohio

AGENT: Alfred H. Schutte, Cologne, Brussels, Paris, Milan, Bilbao and Barcelona.

"Capital"

"ULTRA CAPITAL"

New Water Hardening High Speed Steel

"Capital"

Keen edge, lasts 5 to 8 times ordinary high speed.

POLISHED DRILL RODS, all sizes, carbon and high speed in stock. Flat, square and octagon drill rod. Lime bright rods, tempered wire, annealed cast steel wire, flat wire. Cold rolled strips, all grades.

New Catalogue H, 128 pages, sent on request.

Edgar T. Ward's Sons, 23-25 Purchase St., Boston, Mass.

BANTAM ANTI-FRICTION CO.

Bantam, Conn.

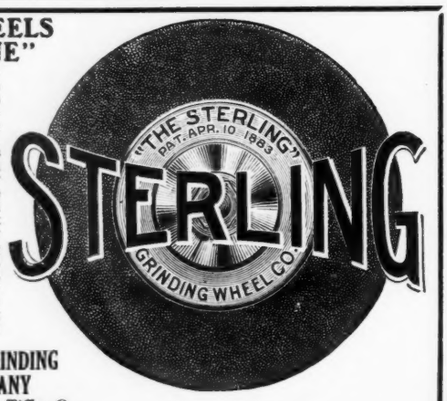
PEDRICK TOOL & MACHINE CO.

Improved Cylinder Boring Bars, Crank Pin Turning Machines, Portable Millers, Pipe Benders, etc.

3639 Lawrence St., Philadelphia, Pa.

THE "WHEELS OF FORTUNE"

When the purchasing agent says "Sterling" on his grinding wheel order, it's fortunate for the whole shop. Sterling Wheels are made in all sizes for every purpose. Try one on something hard to grind—use it every day—all day—and note its durability and good service, then you'll understand why we call them "Sterling." A test is best—will you make it?



THE STERLING GRINDING WHEEL COMPANY

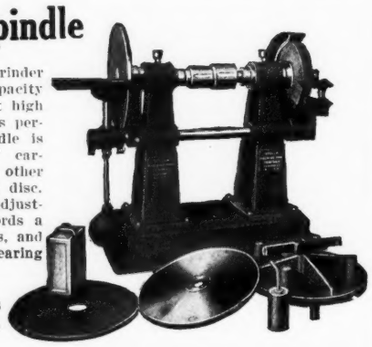
Factories & Offices, Tiffin, O.

SELLING AGENCIES: New York, 45 Vesey St. Chicago, 30 N. Clinton St. San Francisco, 139-149 Townsend St.

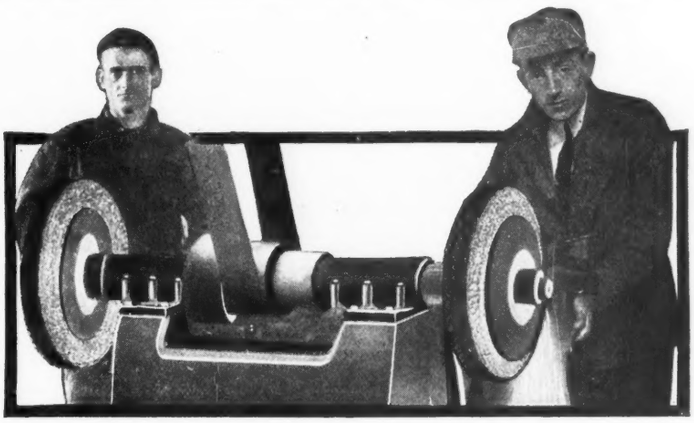
The Long Spindle

on the Sellew Disc Grinder tells the story of its capacity for accurate grinding at high speeds. One end of this perfectly aligned 40" spindle is fitted with a 14" x 2" carborundum wheel, the other end has a 20" grinding disc. The swinging table, adjustable to any angle, affords a wide range of usefulness, and the dust-proof ball bearing journals give long life.

Write for full details of Sellew Grinders.



SELLEW MACHINE TOOL COMPANY, Pawtucket, Rhode Island



EVEN THE BOND CUTS

Yes, the very material that holds the various particles of an ABRASIVE Wheel together has cutting properties. Thus you get a wheel that cuts through and through.

ABRASIVE FAST CUTTING WHEELS

"Every Grain Bites."

There is an ABRASIVE suited to every grinding condition, and if you will tell us the kind of work you require them for we will send you the wheel best suited to your purpose to try out. *Let's have that letter now—you can't go wrong and there's no obligation.*

ABRASIVE MATERIAL CO., Philadelphia, U. S. A. CHICAGO STORE 566 W. Randolph Street

FOREIGN AGENTS: E. Sonnenthal, Jr., Berlin, Cologne and Vienna; Wilh. Sonesson & Co., Malmo and Copenhagen; Alfred Herbert (France), Ltd., Paris; Spliethoff, Beeuwkes & Co., Rotterdam, Holland; R. S. Stokvis & Fils, Brussels, Belgium; Alfred Herbert, Ltd., Milan, Italy; Donnell & Palmer, Buenos Aires, Argentina; George Hatch, Ltd., London, E. C., England.

No. 5 GRINDER

This grinder is of heavy modern design with self-oiling bearings throughout, and may be run continuously without delays due to need of lubrication.

Spindle is of carbon steel ground to size and run in self-oiling babbitted bearings which are line reamed to size. Spindle is made with two step cone pulley.

Wheel Guards are cast strong and heavy and are adjustable to allow for wear of wheels.

Ask YOUR DEALER or write for catalogue describing our line of grinder.

J. G. BLOUNT COMPANY
EVERETT, MASS., U. S. A.

What We Say We Mean

When we claim that Vitrified Grinding Wheels are made of Crystal Corundum, 95% pure, that they are noted for fast cutting qualities; that the bond is almost as hard as the abrasive; that the vitrified process of manufacture makes the wheel porous, free cutting and non-glazing; that there is little danger of overheating and drawing the temper of the work; that they require very little dressing; that they outcut and outwear other wheels of same style and grade, we are only stating the plain, unvarnished truth.

Send for a wheel on trial and prove it.

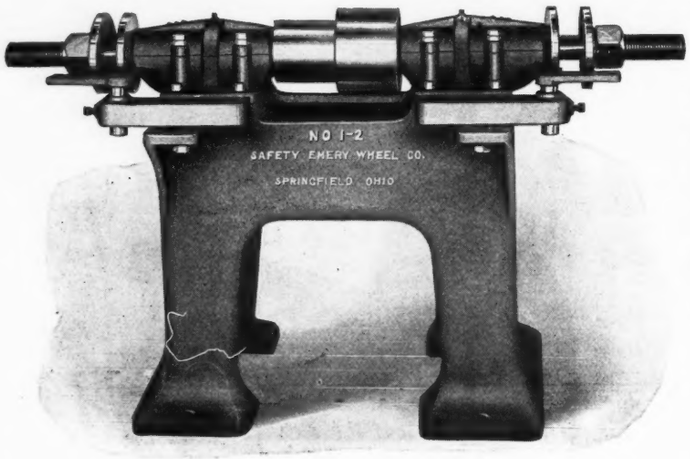
VITRIFIED WHEEL COMPANY
WESTFIELD, MASS.

BEST BY TEST

The line of machines of which the one shown is representative is the "ULTIMATE" in the floor grinder field.

THEY HAVE:—

Long Bearings.
Heavy Spindles.
Great Power Capacity.
Heavy Parts Throughout
Best Materials.
Best Workmanship.
Jigged Dimensions Throughout.



THEY ARE:—

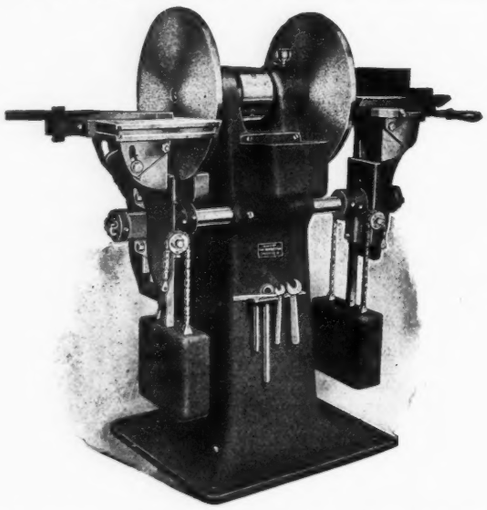
Not cheaper but better.
Not light but heavy.
Not short lived.
Best by test.
In stock ready to ship.
Capable of doing the heaviest work.
Guaranteed to be as represented.

These floor grinders are built in 6 sizes, one of which is sure to suit you. There are some manufacturers who try to sell the grinders of their own make from THE SAFETY catalogue and reputation. Beware of these people or you will get STUNG. Give us an opportunity to prove any or all of the above.

The Safety Emery Wheel Co., Springfield, Ohio

FOREIGN REPRESENTATIVES: Pfeil & Co., London. Adler & Eisenschitz, Milan. De Fries & Co., Act. Ges., Dusseldorf, Berlin, Wien and Paris.

Always Ready to Grind



Use a machine that's always ready; no time is lost in adjusting Rowbottom Disc Grinders. They run true at every speed. Hess-Bright Ball Bearings keep the spindle in perfect alignment all the time. Every operating convenience is incorporated and construction is strictly high grade.

Accuracy, speed and maximum service are at your command when you use a "Rowbottom" Disc Grinding Machine.

Full details on request.

THE ROWBOTTOM MACHINE COMPANY

Waterville, Conn., U. S. A.

WET GRINDING THAT PAYS

Clean water is essential to good wet grinding, dirt or other foreign matter is likely to cause trouble. *Milwaukee Wet Grinders* put wet grinding on a paying basis; the Patented Air Jet allows only clean water to pass—all dirt and sediment settles; a foot pedal regulates flow and an extra large bowl provides for the overflow.

Milwaukee wet grinding machines make grinding easy—no dirt or grit. You don't have to stop for water—press the pedal. The price is reasonable. Write for details on this grinder and the "Milwaukee Shaper."

LUTTER & GIES CO.

MILWAUKEE, WIS.

AGENTS: O. L. Packard Machinery Co., Milwaukee. Compressed Air Machinery Co., San Francisco, Cal.

Split Your Inspection Cost Down the Middle

LIMIT GAGES

Reduce Inspection Cost—Insure Interchangeability

These gages are for testing the pitch diameter (sometimes called "angle diameter") of screw threads.

The contacts are hardened cone points carefully ground to the angle of the thread wall. Errors due to changing angles of helix are thus automatically eliminated.

The points are not placed directly opposite each other, but are offset a distance equal to one-half the pitch of the thread being gaged. The diameter is, therefore, taken from a solid bearing upon the thread wall, the only bearing from which pitch diameter can be reliably obtained.

Fork Type for Threads up to 2 inches

Mounted on Standard permitting inspector to use both hands in his work

Crescent Type for Threads over 2 inches

Mounted on Standard

LIMIT GAGES

Are Used by Progressives

The work should *pass* the upper contacts (maximum), but should *not pass* the lower contacts (minimum).

The cone points are made adjustable by set and locking screws and may be *sealed* to prevent tampering.

New Catalogue, finely illustrated, describing Thread Gages, Cylindrical Gages, Standard Gages, Limit Gages, Screw Pitch Gages, etc., sent free upon request.

WELLS BROTHERS COMPANY

GREENFIELD, MASS., U.S.A.

NEW YORK
107 Lafayette Street

BOSTON
163 Oliver Street

CHICAGO
568 W. Washington Boulevard

149 Queen Victoria Street, London, E. C.

TOOL STEEL

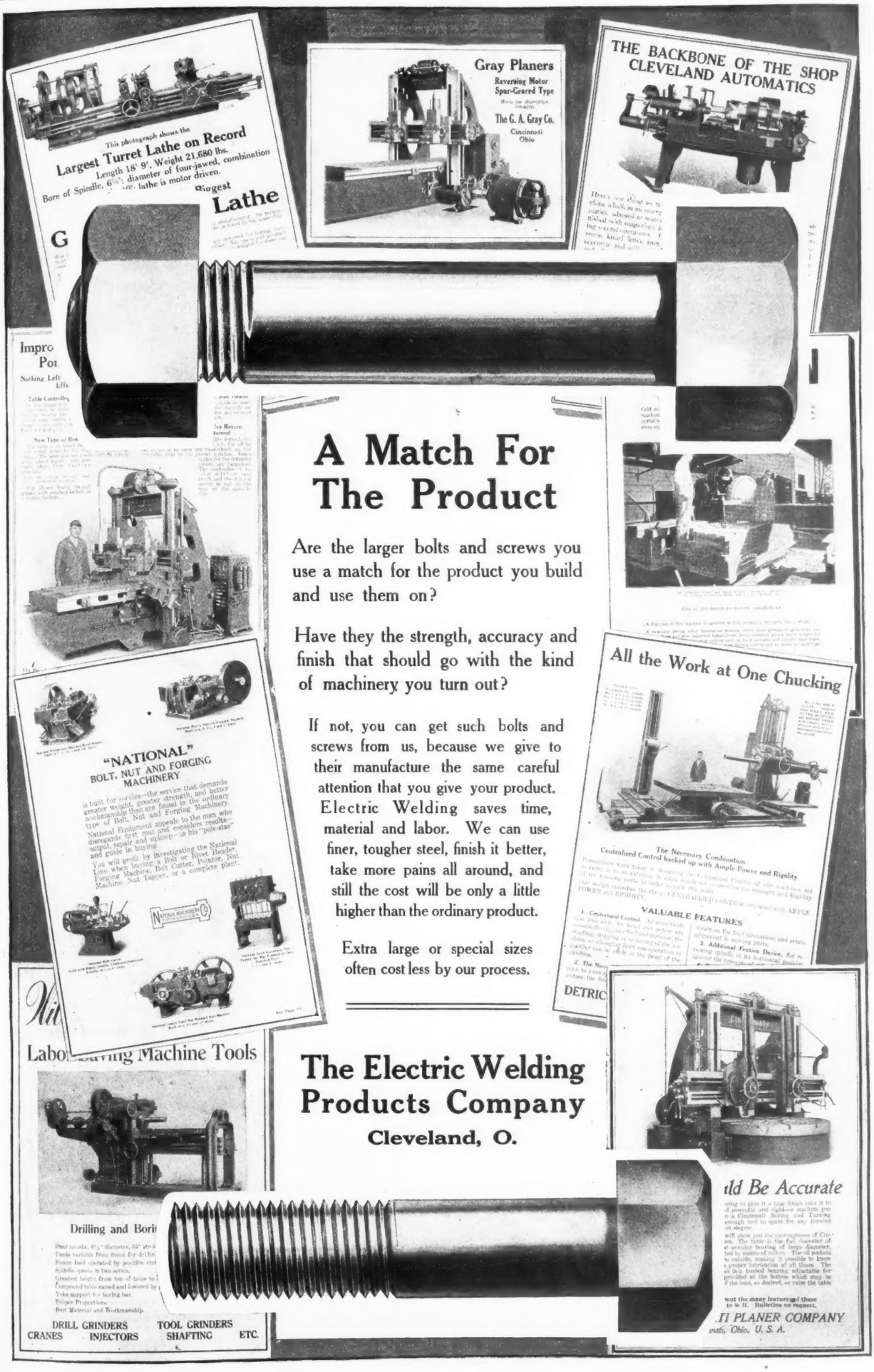
FOR EVERY PURPOSE

BLUE CHIP AND OTHER
FIRTH-STERLING-STEELS
ARE RECOGNIZED
STANDARDS OF QUALITY
WHEREVER FINE TOOLS
ARE USED

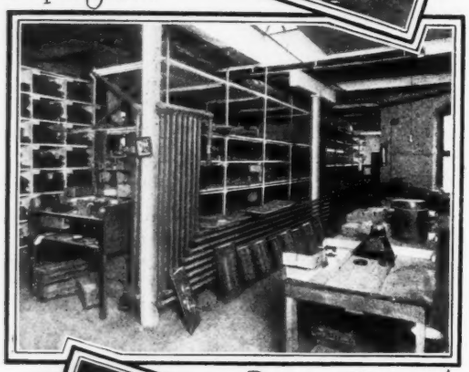
FIRTH-STERLING STEEL COMPANY

Works at McKEESPORT, PA.

BOSTON NEW YORK PITTSBURGH CLEVELAND
CHICAGO PHILADELPHIA SAN FRANCISCO

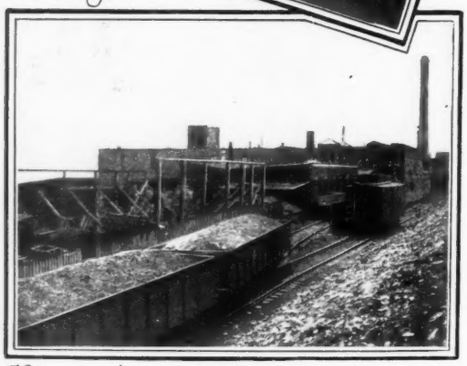

This photograph shows the
Largest Turret Lathe on Record
Length 18' 9", Weight 21,680 lbs.
Bore of Spindle, 6¼"; diameter of four-jawed, combination
Biggest
Lathe
Gray Planers
Reversing Motor
Spur-Geared Type
The G. A. Gray Co.
Cincinnati
Ohio
THE BACKBONE OF THE SHOP
CLEVELAND AUTOMATICS
A Match For
The Product
Are the larger bolts and screws you use a match for the product you build and use them on?
Have they the strength, accuracy and finish that should go with the kind of machinery you turn out?
If not, you can get such bolts and screws from us, because we give to their manufacture the same careful attention that you give your product. Electric Welding saves time, material and labor. We can use finer, tougher steel, finish it better, take more pains all around, and still the cost will be only a little higher than the ordinary product.
Extra large or special sizes often cost less by our process.
"NATIONAL"
BOLT, NUT AND FORGING
MACHINERY
All the Work at One Chucking
The Necessary Combination
Centralized Control backed up with Ample Power and Rigidity
VALUABLE FEATURES
The Electric Welding
Products Company
Cleveland, O.
Drilling and Bori
DRILL GRINDERS
CRANES
INJECTORS
TOOL GRINDERS
SHAFTING
ETC.
ıld Be Accurate
.TI PLANER COMPANY
nati, Ohio, U. S. A.

Molding Department



Pattern Storage

Melting Furnaces



Shipping Facilities

Molding Department

HAND MOLDING

JUST before finishing the last mold on each order, the molder presses a button which communicates the exact condition at his bench, to the order clerk. The molder is at once supplied with another pattern and order card. The order clerk checks the molds and castings made, for his records. In this way the molder loses no time and the records are clearly and accurately kept.

Lumen Bearing Company
BRASS FOUNDERS
BUFFALO TORONTO

"Imperial" Air Hoists

The productive capacity of a machine tool is largely determined by the facilities provided for serving it and handling its work.

An "Imperial" Hoist with a suitable mounting, serving one—or several—tools will assure maximum capacity for each tool by making it possible to lift, adjust and remove work in the shortest time and with the least effort.

This convenience of the "Imperial" is only one of its features.

It is highly economical of air—cleanly and smooth-running—has and needs no brake—is remarkably durable.

Shop efficiency which ignores the possibilities of the "Imperial" Hoist is not thorough.

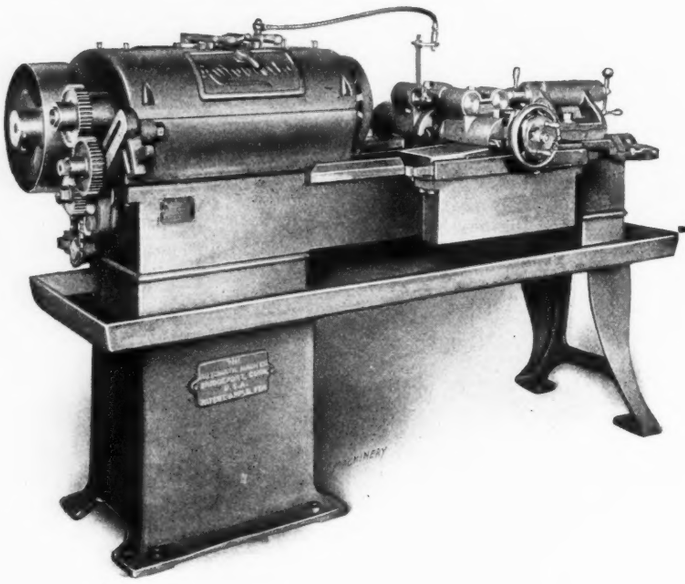
INGERSOLL-RAND CO.

NEW YORK LONDON

Offices the World Over

Air Tools Compressors Air Hoists

H-14



The Automatic Threading Lathe Cuts this Screw in Four Minutes

Here are examples of internal and external thread cutting on the Automatic Threading Lathe, the time for which should prove interesting to any man who has threads to cut in quantities.

The screw is of cold-rolled steel with a thread 4 inches long, 1½ inches diameter and a ¾-inch lead. "Automatic" time for this piece is exactly four minutes. The cast-iron nut to fit this screw is threaded in twelve minutes. Remember also that work turned on the "Automatic" is finished perfectly and to exact size—"Automatic" time is complete time.

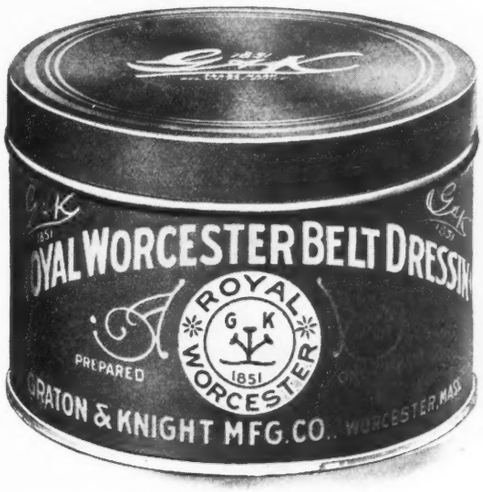
Cutting tools are provided on both sides of the work, cutting strains are balanced. Tools are automatically relieved and returned to the starting point by positive mechanisms. Square, Acme, U. S. or V threads can all be cut —and any pitch of thread from 2 inches lead to a thread fine enough for a micrometer.

Send us a few pieces of work; we'll tell you how long it takes to thread them on the "Automatic"—the quality you can judge for yourself.

AUTOMATIC MACHINE COMPANY

BRIDGEPORT, CONNECTICUT

AGENTS: Alfred H. Schutte, Schuchardt & Schutte, C. W. Burton, Griffiths & Co. of London, England. Marshall & Huschart Machinery Co. of Chicago, Ill., and Motch & Merryweather Machinery Co. of Cleveland, O.



Royal Worcester Belt Dressing

As Necessary for Your Belt as Oil is for Your Bearings

It's a water-proof compound absolutely free from chemicals, or any substance of an injurious character to the leather. On the contrary, it is a preservative and will keep the belts in a pliable condition, prolong their life, prevent slipping and cause them to wrap the pulleys perfectly.

We, the makers of the famous Spartan Belting, stand back of ROYAL WORCESTER BELT DRESSING—we guarantee this dressing unreservedly—we know its ingredients—we know those ingredients are of proper proportions to preserve and renew the life of your belts, to prevent their slipping and to enable them to transmit the maximum of power.

GENEROUS TRIAL CAN

We will send you a generous sized sample can of Royal Worcester Dressing to try out on your belt. **Use the coupon or your letterhead.**

The Graton & Knight Mfg. Company

Oak Leather Tanners and Belt Makers

Norfolk and Suffolk Streets WORCESTER, MASS., U.S.A.

G & K BRANCHES

Atlanta	Detroit	Minneapolis	Portland, Ore.
Boston	Fall River, Mass.	New York	San Francisco
Chicago	Kansas City, Mo.	Philadelphia	Seattle
Cleveland	Milwaukee	Pittsburgh	St. Louis

Selling Agents for Texas: Graton & Knight Mfg. Co. of Texas, Dallas, Texas.

COUPON

Mchy.

Graton & Knight Mfg. Company,
Worcester, Mass.

Gentlemen: Kindly send at once one generous trial can of the Royal Worcester Belt Dressing.

Name.....

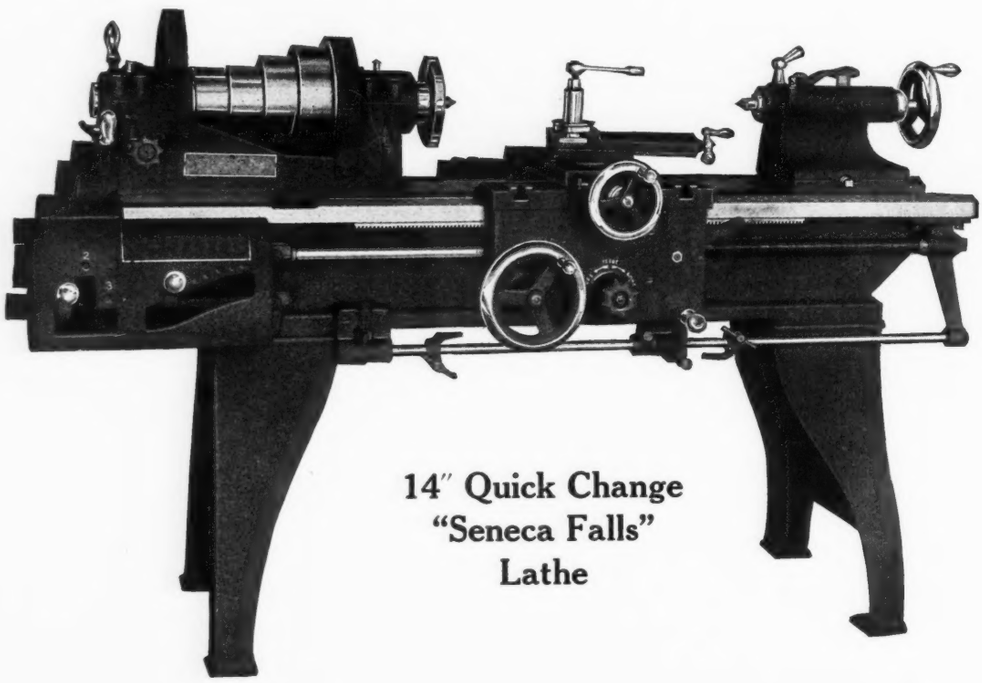
Company.....

Position.....

Address.....

Lathe Users Will Appreciate the "Seneca Falls" Micrometer Stops

Among the many modern production features on "Seneca Falls" Quick Change Engine Lathes, the Micrometer Cross-Feed Stop used *only* with hand feed, is especially advantageous. By turning the knob of the micrometer barrel from you, the relative position of the stop mechanism is changed and allows tool to advance. Tool may be fed away from work as far as desired and when returned will stop at position indicated by micrometer graduations.



14″ Quick Change "Seneca Falls" Lathe

"Seneca Falls" Lathes have passed through a long period of experimental preparation and are now rated among representative high-grade lathes.

Forty-eight combinations of change gears are instantly available, affording great operating convenience; a reverse device in the headstock controls cross, longitudinal and screw feeds and an automatic safety device in the apron prevents engaging opposite feeds.

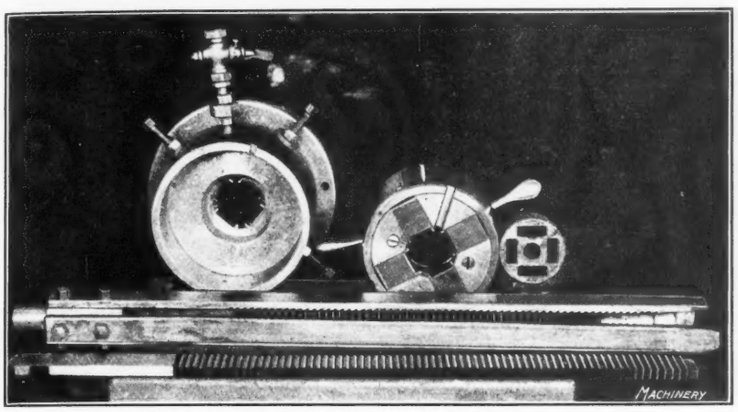
The material and workmanship of "Seneca Falls" Lathes are up to the highest present day standards and we take pleasure in offering the trade a thoroughly reliable machine.

The catalogue will be mailed on request.

THE SENECA FALLS MFG. COMPANY

330 Water Street **SENECA FALLS, N. Y.**

Canadian Sales Agents: The Canadian Fairbanks Company, Ltd., Montreal, Toronto, St. Johns, N. B., Calgary, Saskatoon, Winnipeg, Vancouver.



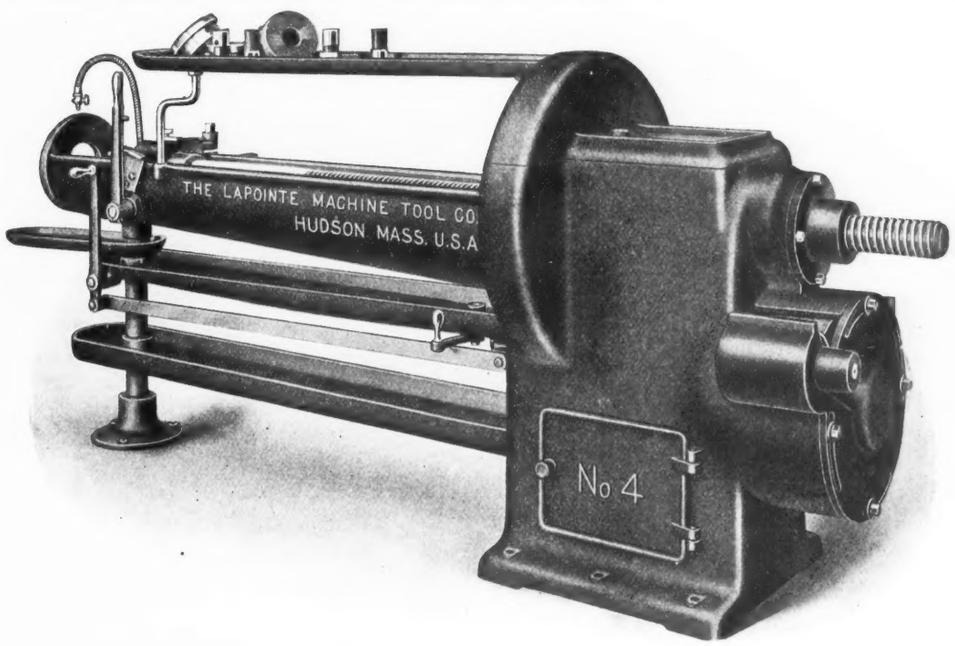
Broaching Four Holes at Once

An interesting example of what broaching can do is shown in the engraving. The work, an automobile part manufactured by the Kinsler-Bennett Company of Hartford, Conn., in which four rectangular holes must be accurately spaced and sized, is shown at the right. A large fixture is placed on the face plate of the machine, the four hardened jaws of which are so adjusted that the cuts made by the four-sided broach will be equidistant from the center.

There are no teeth on the outside of this first set of broaches, only the inner faces of the work being finished on the first draw. In the second operation another set of four broaches, one of which is shown in the foreground, are substituted. These broaches are flat on their inner faces and slide on the part previously broached while finishing the other three sides of each rectangular hole.

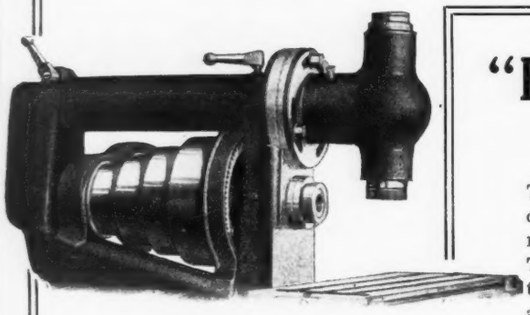
Both operations are completed at the rate of eighteen finished pieces per hour —remarkably good time considering the accuracy of the work and the double operation.

If you are not just sure what broaching can do, write us, send us a sketch and we'll show you wherein Lapointe Machines will save money—not only as compared to milling and other operations, but when compared with other broaching methods

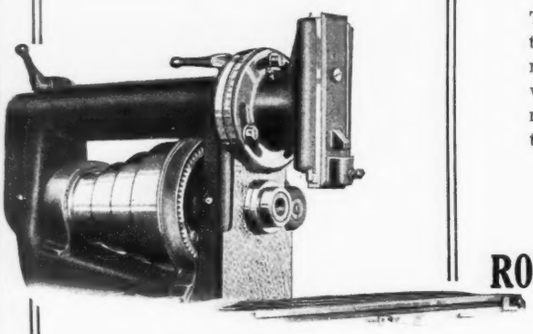


The Lapointe Machine Tool Co., Hudson, Mass.

FOREIGN AGENTS: C. W. Burton, Griffiths & Co., London. F. G. Kretschmer & Co., Frankfurt, a/M., Germany. Louis Besse, Paris, France. Wilh. Sonesson & Co., Malmo, Sweden. Philip Roeder, Mexico. D. F. D. Drury & Co., Johannesburg, South Africa. R. S. Stokvis & Fils, Bruxelles, Belgium. A. H. Schutte, St. Petersburg, Russia.



Vertical Attachment



Slotting Attachment

"Rockford" Attachments Are Strong and Accurate

The strength and accuracy of Rockford Milling Machine Attachments cannot be questioned; they are made from the best materials by men who are experts. The accuracy of alignment and smooth running qualities of these attachments are features that men talk about—the limit of error is so small it can hardly be detected.

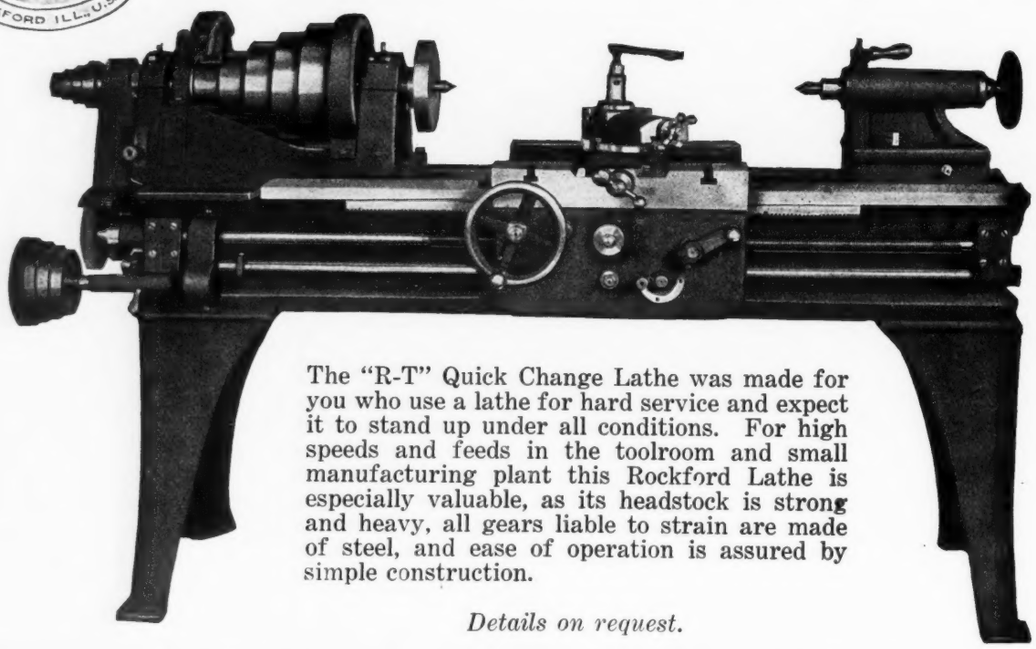
The position of "Rockford" Attachments is right—they are fastened above, not below the spindle on the milling machine, thereby permitting a wide range of work, heavy cuts and greater output. All attachments are gear driven—steady, long-lived and thoroughly efficient.

Remember the "Rockford" when contemplating milling machines. Ask for catalogue.

ROCKFORD MILLING MACHINE COMPANY

ROCKFORD, ILLINOIS, U. S. A.

There's a Reason for Everything Here's the Reason for "Rockford"



The "R-T" Quick Change Lathe was made for you who use a lathe for hard service and expect it to stand up under all conditions. For high speeds and feeds in the toolroom and small manufacturing plant this Rockford Lathe is especially valuable, as its headstock is strong and heavy, all gears liable to strain are made of steel, and ease of operation is assured by simple construction.

Details on request.

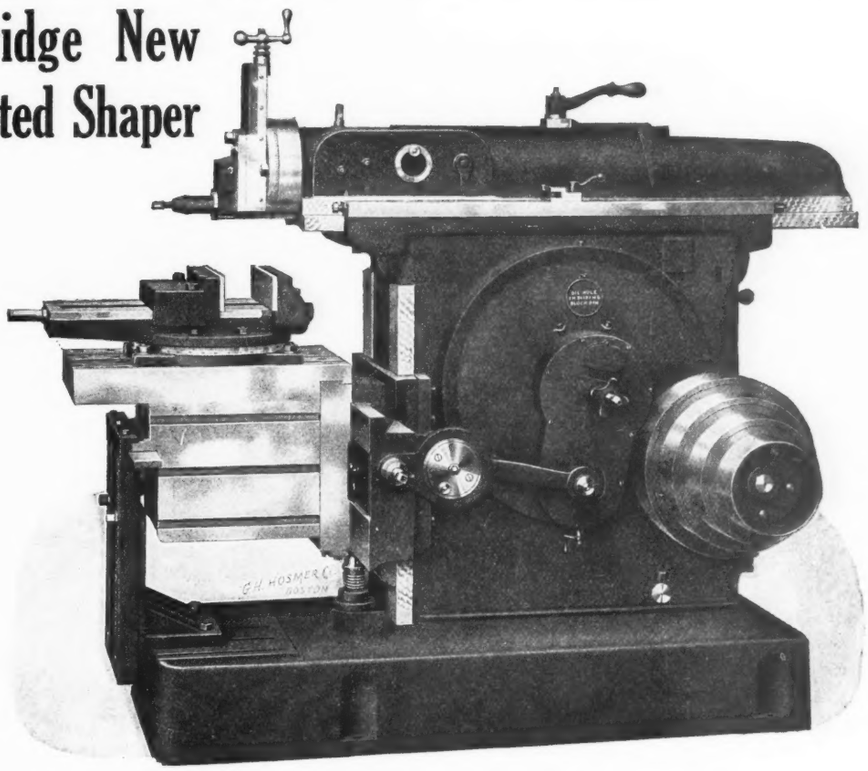
ROCKFORD TOOL COMPANY, Harrison Avenue & Eleventh Street, **ROCKFORD, ILL., U. S. A.**

24-inch Stockbridge New Heavy Duty Patented Shaper

No story need go with this illustration.

It speaks its own from the Base up. Look at that Base — Rigidity. Built right into each machine is Stockbridge Quality.

A Shaper that can be used on the closest work.

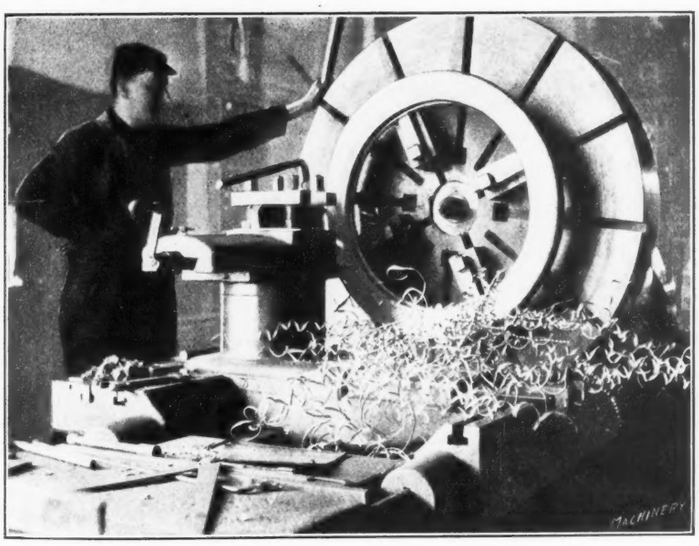


STOCKBRIDGE MACHINE COMPANY, Worcester, Mass.

SELLING AGENTS: Niles-Bement-Pond Co., 111 Broadway, New York City; Boston, Philadelphia, Pittsburgh, Cleveland, Hamilton, O.; Detroit, Chicago, St. Louis. **Gulf States:** N. C. Walpole, Brown-Marx Bldg., Birmingham, Ala.; Alexander & Garsed, Charlotte, N. C.; Harron, Rickard & McCone, San Francisco and Los Angeles, Cal.; Eccles & Smith Co., Portland, Ore.; The Canadian Fairbanks Morse Co., Toronto and Montreal, Canada; Taylor & Young, Ltd., Vancouver, B. C.

FOREIGN REPRESENTATIVES: Schuchardt & Schutte, Berlin, Vienna, London, Stockholm, St. Petersburg, Shanghai, Tokio, Budapest, Prague; Leon Chapuis & Cie, Paris; Henri Benedictus, Antwerp; Santasilia-Gallotti Co., Naples; Allied Machinery Company of America, Zurich.

Tire Molds Turned on a "New Haven" are Accurate



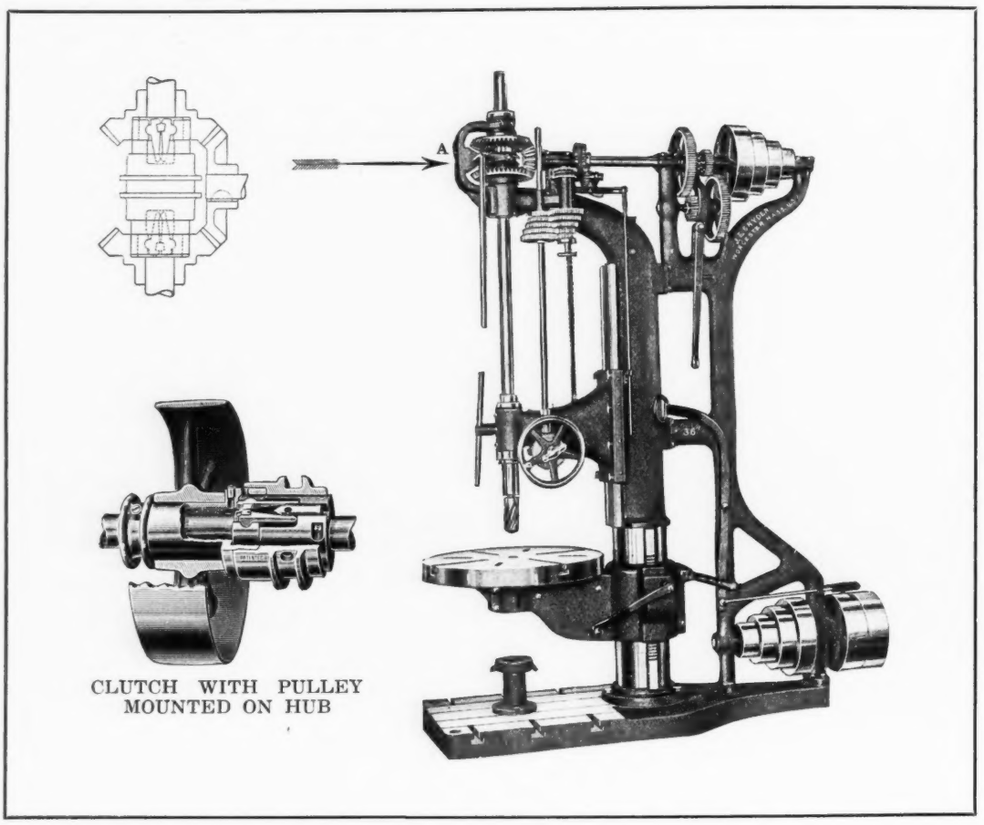
New Haven Lathes are used in the shops of J. E. Thropp & Sons, Trenton, N. J., for turning steel tire molds, which are made from very stringy, tough, fifty-point carbon steel. The finished work must be accurate, perfectly smooth, free from chatter marks or rough cutting—that's why the "New Haven" is preferred. The proof of "New Haven" service in this shop lies in the fact that it is only five years since the first *New Haven Lathe* was installed and now there are *seven*, running twenty-three and one-half out of every twenty-four hours.

If your work requires a heavy duty, accurate, durable lathe, investigate the New Haven. Catalogue on request.

NEW HAVEN MFG. COMPANY, New Haven, Conn.

THE JOHNSON FRICTION CLUTCH

It Makes the Best Possible Tapping Arrangement for Snyder Drill Presses



CLUTCH WITH PULLEY MOUNTED ON HUB

AS incorporated in the Snyder Drill Press the Johnson Friction Clutch makes the best possible tapping arrangement and eliminates the necessity of any other tapping device being used with the machine. One Double Johnson Friction Clutch, as per line cut in nest of gears at "A."

Write for Catalog "A"

It will pay you to know more about Johnson Friction Clutches.

Ask us to send you our interesting book *"Clutches as applied in Machine Building."*

Your local Supply House WILL BE PLEASED TO QUOTE YOU.

CARRIED IN STOCK BY: Strong, Carlisle & Hammond Co., Cleveland, Ohio; The Thomas & Lowe Machinery Co., Providence, R. I.; N. J. Engineering & Supply Co., Passaic, N. J.; The Fairbanks Co., New York, N. Y.; Philadelphia, Pa.; Buffalo, N. Y.; and Syracuse, N. Y.; The Atlanta Mfg. & Supply Co., Atlanta, Ga.; Edwin W. Howard, Rochester, N. Y.; Vonnegut Machinery Co., Indianapolis, Ind. Lewis E. Tracy Co., Boston, Mass.; Hertzler & Zook Co., Belleville, Pa.; Treat Hardware & Supply Co., Lawrence, Mass; Berkshire Mill Supply Co., Pittsfield, Mass.; W. J. Foss Co., Springfield, Mass; Foster & Janes, Brooklyn, N. Y. **Foreign Agents** in all the principal foreign countries.

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

Parsons' Manganese Bronze
For Heavy Duty Gears

Tremendous loads are transmitted by the gears used in the hoisting mechanism for the lock gates at the Sault Ste. Marie Canal, and Parsons' Manganese Bronze has been chosen as the best material to stand the strain.

The big "Hindley" wormwheel shown was made by the Albro-Clem Elevator Co., Philadelphia, Pa. Its rim contains 2965 pounds of "Parsons" Bronze, with a tensile strength of 80,000 pounds per square inch and an elastic limit of 41,500 pounds.

Heavy Duty Gear Problems are our specialty. There are six different Cramp gear metals and long experience has taught us the best *metals* to recommend for specific needs.

Place your gear problems in our hands — ask for complete information.

WM. CRAMP & SONS SHIP AND ENGINE BUILDING CO.

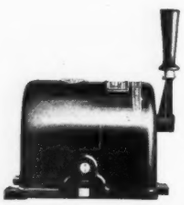
PHILADELPHIA, PENNSYLVANIA, U. S. A.

E. C. & M.

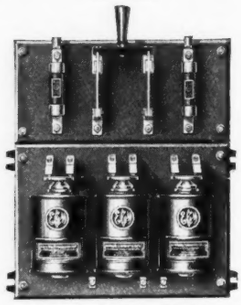
AUTOMATIC MACHINE TOOL CONTROLLERS

INCREASE THE OUTPUT

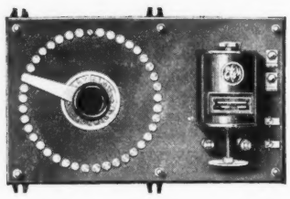
10% —— TO —— 40%



Operators Switch



Accelerating Unit



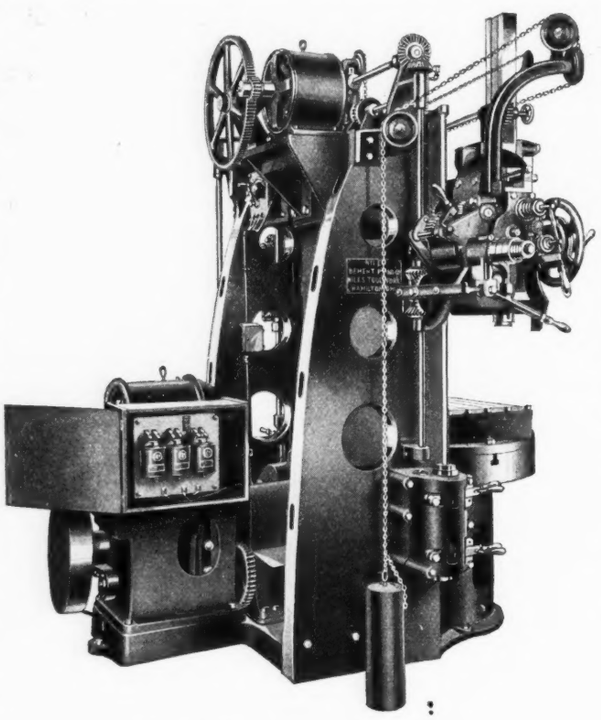
Field Rheostat and Relay

For a motor-driven Boring Mill the following control apparatus should be used: An Operators Switch—an Accelerating Unit—A Field Rheostat and Relay.

Position Plate

The accompanying picture of the Position Plate on the Type HRB Operators Switch shows how the Motor can be controlled by moving the handle to the five different positions. The Field Rheostat provides just the right cutting speed, and this can be readily varied as the diameter of the cut changes on facing work.

To start the Motor, merely throw the Operators Switch handle to the running position, and the machine at once accelerates to the speed determined by the setting of the Field Rheostat. It does this in the shortest, safe time. The Motor can be reversed from full speed one way to full speed the other by throwing the handle of the Operators Switch. The Motor current will be automatically limited to safe values, and the change in direction of rotation will be made in the shortest, safe time. To stop, throw the handle to position marked "Off and Brake," and the Motor will be stopped by dynamic braking in the shortest, safe time. On a test on a 60-inch Boring Mill, stopping by dynamic braking was accomplished in 2¼ seconds, but the table revolved for 22 seconds, retarded only by friction.



Can you doubt that these time-reducing conveniences increase output?

Send for Pamphlet.

"More Chips"

THE ELECTRIC CONTROLLER & MFG. CO.

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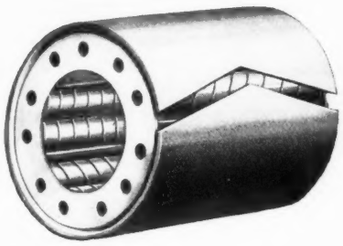
PITTSBURG-OLIVER BLDG. TORONTO-TRADERS BANK BLDG. BIRMINGHAM-BROWN-MARX BLDG.

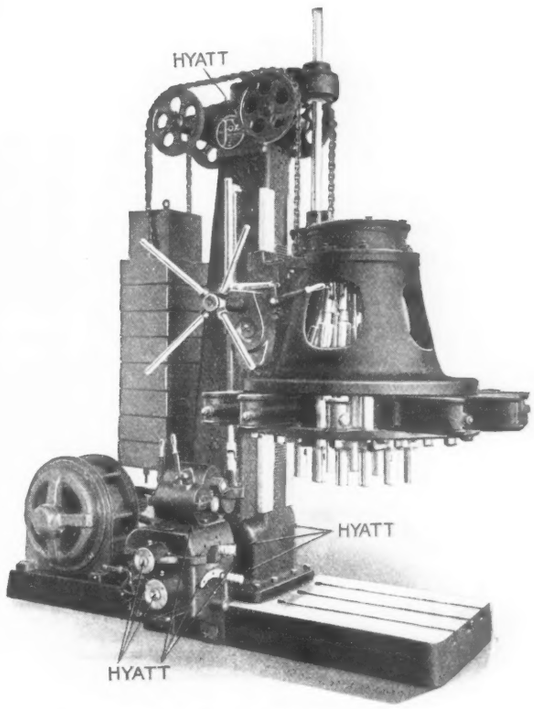


Machine Tool Efficiency is Increased by the use of HYATT BEARINGS

They are being used in Drilling Machines, Multiple Drilling Machines, Milling Machines, Boring Machines, Planers, Radial Drills, Grinders and other tools and in each instance a decided increase in efficiency is traceable to the use of

HYATT FLEXIBLE ROLLER BEARINGS

Tests on a heavy drilling machine demonstrated that the substitution of Hyatt Roller Bearings made possible double the circumferential speed of the drill, without heating the bearings, and with practically no increase in power consumption.



Fox Multiple Spindle Drilling Machine Equipped with Hyatt Flexible Roller Bearings

The high efficiency of Hyatt Bearings is largely due to their distinctive feature, the Flexible Spiral Steel Rollers, which enables them to maintain a line of contact under all conditions and to cushion shocks and jars.

Mail the Coupon and get our comprehensive Bulletins 305 A and 600 A

HYATT ROLLER BEARING COMPANY

Sales Office: 1120 Michigan Ave., Chicago

Factory: Newark, N. J. **Detroit, Mich.**

COUPON

Hyatt Roller Bearing Co., 1120 Michigan Ave., Chicago.

Please mail me Bulletins Nos. 305A and 600A and full particulars in regard to Hyatt Bushings for Machine Tools.

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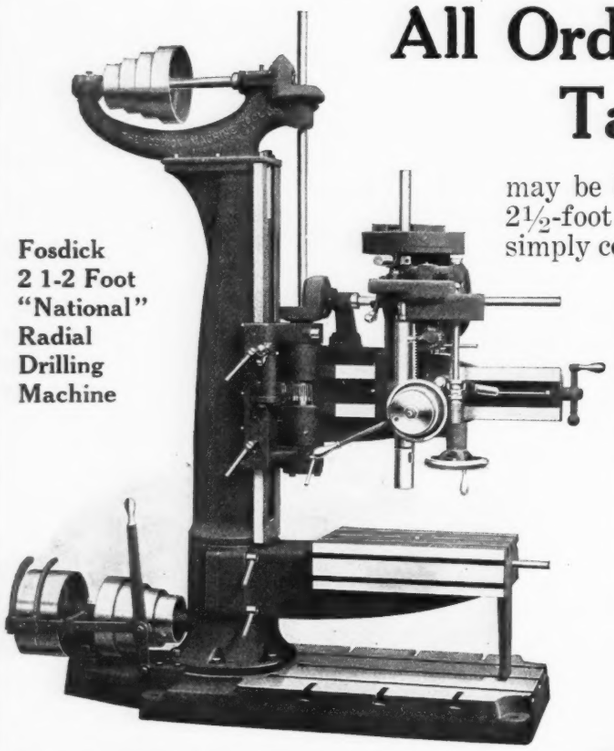
Address .....

2079-B

All Ordinary Drilling and Tapping Work



Fosdick 2 1-2 Foot "National" Radial Drilling Machine

may be handled by unskilled labor on the new 2½-foot Fosdick Radial. The Fosdick is so simply constructed and so easily and conveniently handled that operators do more and better work without the usual fatigue. All levers are reached from natural working position and all changes are easily made. The heavy, deep base; box column of large section and one-piece construction; long arm saddle; back gears located on the head so power can be brought direct to the spindle; geared feed and automatic safety stop are features which make for increased production. And best of all, the price is not high.

You'll be interested in the complete descriptive matter which we'll gladly send.

The Fosdick Machine Tool Co.
CINCINNATI, OHIO, U. S. A.

FOREIGN AGENTS: Ludw. Loewe & Co., Berlin, Germany, Austria-Hungary; Russia and Scandinavia. Fenwick Freres & Co., Paris, France, Belgium, Switzerland, Spain and Italy. Bevan & Edwards Propty., Ltd., Melbourne, Australia. C. W. Burton, Griffiths & Co., London, England. General Supply Co., S. A., Mexico City, Mexico. The A. R. Williams Machinery Co., Ltd., Toronto, Ontario, Canada.

Small Drills in Multiple

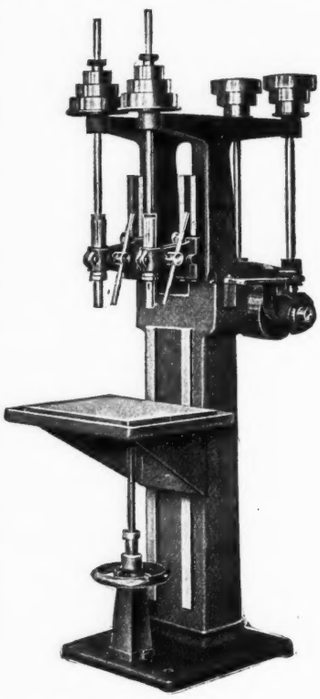
For drilling small holes, working fast and holding accuracy, the Taylor & Fenn manufacturing Multiple Spindle Drilling Machine cannot be surpassed. It affords the right speed and the right feed for drilling up to ¾" diameter, and a ½" hole one inch deep can be drilled in cast iron in four seconds. A series of gears and silent chains have proven much better and more efficient than belts for driving a machine of this type—they will not slip, there is less friction, and speed changes are more readily made.

Send for specifications—ask for catalogue.

THE TAYLOR & FENN COMPANY
HARTFORD, CONN.

EUROPEAN AGENTS: E. Sonnenthal, Jr., Berlin, Cologne and Vienna. R. S. Stokvis & Zonen, Ltd., Rotterdam and Brussels. Alfred H. Schutte, Paris, Milan and Barcelona. Schuchardt & Schutte, Stockholm, Copenhagen and St. Petersburg. C. W. Burton, Griffiths & Co., London.

REED MULTIPLES



YOUR ULTIMATE DRILLS

Better Start Right

Simple
Substantial
Accurate

14" and 16" Swing
Capacities 1/2"-3/4"-1"
Power Feeds
Back Gears

Behind every **REED** Drill is 25 years' experience in building good drills.

Our prices are sure to interest. *We guarantee our work.*

FRANCIS G. REED COMPANY
43 Hammond Street **WORCESTER, MASS.**

Lightning Instruction

(World's School of Technology)

Ques.—What is the basic principle governing the prevention of friction in designing metal cutting tools?

Ans.—The support back of the cutting point or edge must be relieved to prevent dragging, tearing and consequent heat.

Ques.—Cite an example where this principle is in practice?

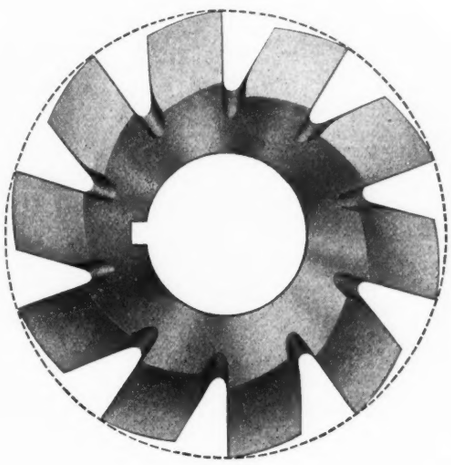
Ans.—Milling cutters—the photo attached illustrates the idea.

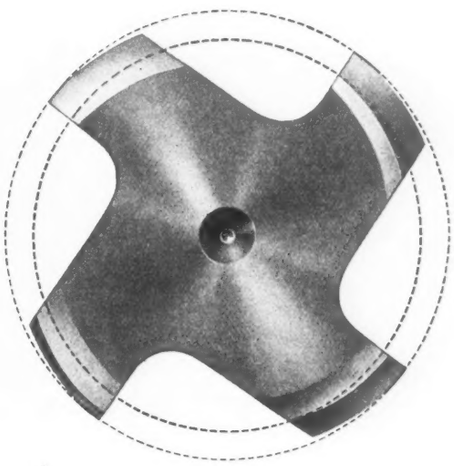
Ques.—Name other tools which should be governed by this same principle?

Ans.—Taps, Lathe-tools etc.

Ques.—Are taps always formed after this manner?

Ans.—No. Strange to say there is but one Tap on the market with this scientific relief **built in.** It is called "Lightning" by the manufacturers. An end view of one is given in the attached photo.





"Lightning Taps" are different from all other taps of whatever name or nature. They are different in **design;** they are **made** differently; they **act** differently when at work. They are just as economical in **practice** as they appear to be in **theory.**

If you don't know "Lightning" Taps, you ought to.

Made by the pioneers

Wiley & Russell Mfg. Co., *Greenfield, Massachusetts,* U. S. A.

New York, 90 Center Street. Philadelphia, 38 No. Sixth Street. Chicago, 545 W. Washington Boulevard.

The 30 per cent Stronger Wrench—

The Best Tool in the Kit

When a man is working in some out-of-the-way place—where he has to reach high up or low down or far out—where a wrench must take hold firmly and hang on under difficulties—then is the time he needs a "Coes" Genuine.

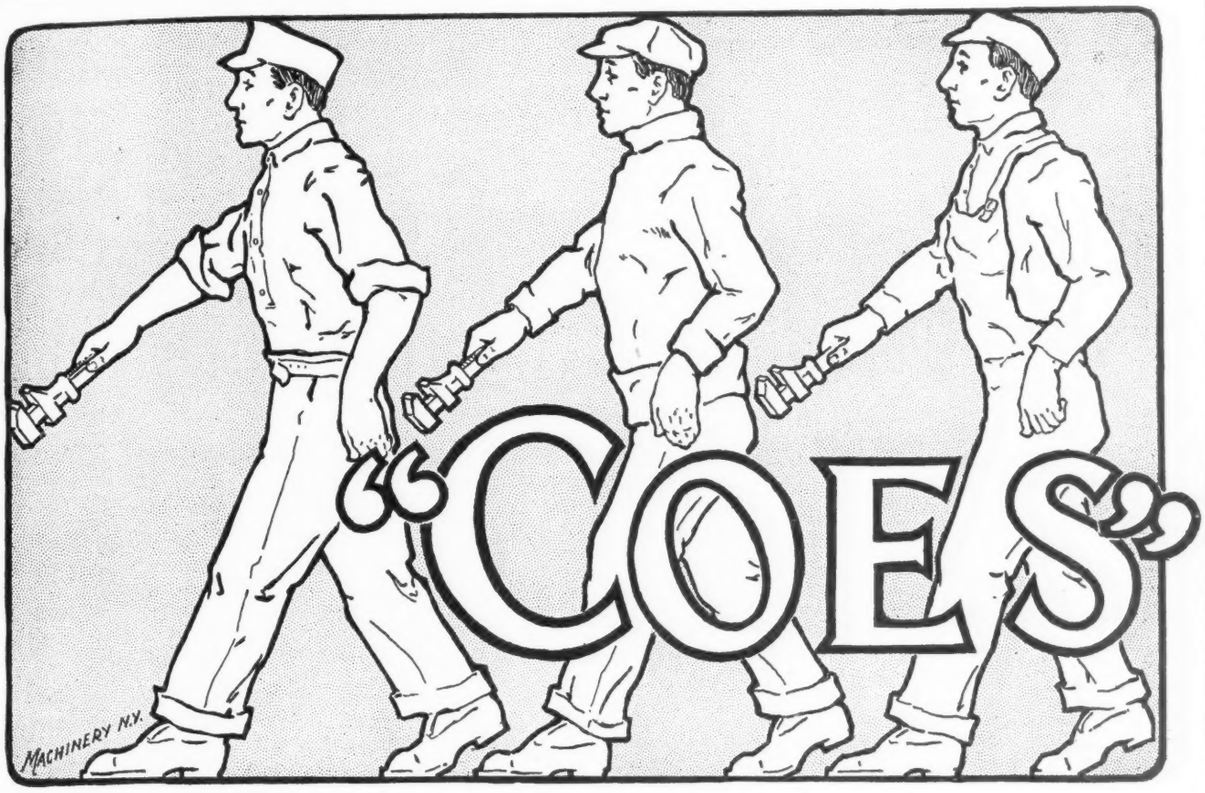
The "Coes" is designed for difficult service—the 30% greater strength is put where it will do the most good.

In the engine room—on the bench—in a trench—especially where a wood handle wrench can't stand the heat or the dampness, is where you need "Coes" steel handle wrenches. There is a size for your work—eight to choose from; 4″ to 10″, with standard screw slot; 12″ to 21″, with ball bearing screw and extended screw support.

All Good Dealers Have Them

COES WRENCH COMPANY,

AGENTS—J. C. McCARTY & CO.,
29 Murray Street, New York. 438 Market Street, San Francisco, Cal. 1515 Lorimer Street, Denver, Colo.



A wrench is one of the tools you use every day—a hundred times a day. When you buy keep this in mind: Buy the wrench which stands the strains of hard work, which wears well in constant service. Do as the men who know do—join the procession of "Coes" users. There is no other wrench "just as good as" the "Coes," and the time for you to prove this is right now.

To meet the universal demand for "Coes" Wrenches we make them in five styles and fifty sizes. We make them 30% stronger than any other wrench and to give 30% more service. We make them in the biggest wrench factory in the world, from original patented designs, from best materials. We've been manufacturing the "Coes" for upward of seventy years—though not always in the full line of types and sizes we now carry.

There is always a reason why a tool or machine holds the top against all competition—Quality and thorough Practicality are "Coes" reasons.

Trade Mark on Every Wrench

WORCESTER, MASS., U. S. A.

AGENTS—JOHN H. GRAHAM & CO.,
113 Chambers Street, New York. 14 Thavies Inn, Holborn Circus, London, E. C.; Copenhagen, O., Denmark.

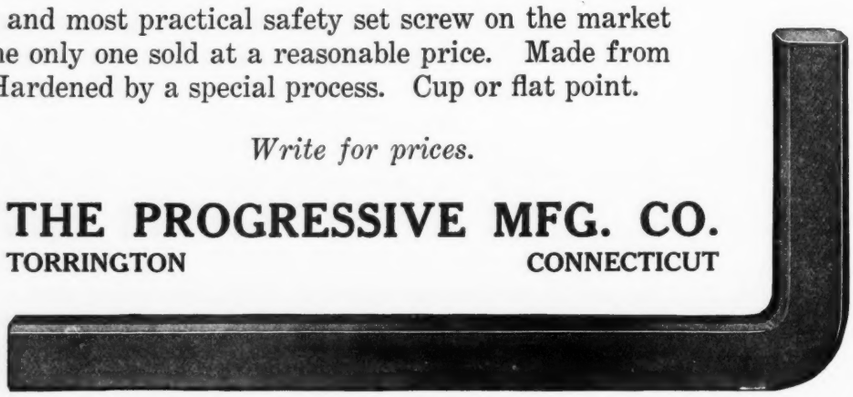
AVOID ACCIDENTS
PREVENT HUMAN LOSS

Demand and Use

"EAGLE" SAFETY SET SCREWS

The strongest and most practical safety set screw on the market today—and the only one sold at a reasonable price. Made from Bar Stock. Hardened by a special process. Cup or flat point.

Write for prices.

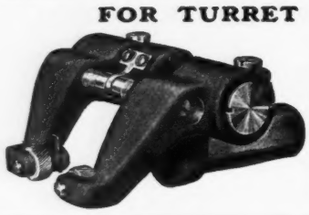


THE PROGRESSIVE MFG. CO.
TORRINGTON CONNECTICUT

ADJUSTABLE

KNURL HOLDER

FOR TURRET MACHINES



This simple tool knurls all diameters from ⅛" to 2½". Stocked with shanks ¾" to 1½" diameter. Fastens in the turret and is pushed on to work like a screw plate.

DRILL VISE

WITH AND WITHOUT JIG ATTACHMENT

Three Sizes. Jaws 6", 9" and 12" long. Always a plain vise, and at the same time holds work for duplicate drilling without cost of a jig.

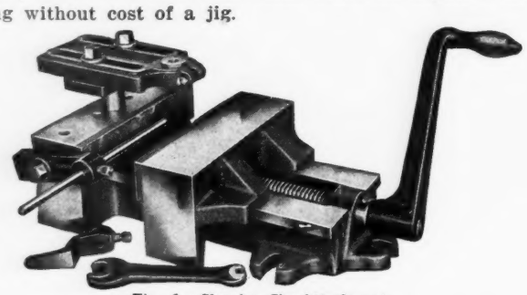


Fig. 1. Showing Jig Attachments.

High Speed Drilling Attachment, or

DRILL SPEEDER

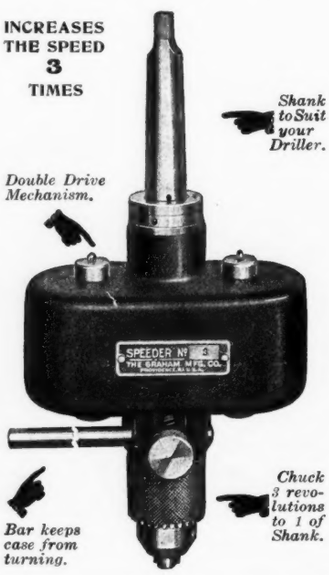
(New line just out)

A device with which you can drill small holes while using the larger class of drillers, say from 20-inch to largest radial. Made in three sizes to accommodate drills 0" to ¾".

INCREASES THE SPEED 3 TIMES

Shank to Suit your Driller.

Double Drive Mechanism.



Chuck 3 revolutions to 1 of Shank.

Bar keeps case from turning.

All Patented.

Get Special Circulars.

THE GRAHAM MANUFACTURING CO., Providence, R. I.

Germany—Schuchardt & Schutte. France, Italy, Spain—Alfred Herbert.

J-M FERRO COMPOUND
Will Make Defective Castings
PERFECT

When sand holes, blow holes, spongy spots, etc., are filled with J-M Ferro Compound it metallizes in a few hours and becomes a permanent part of the casting. Vibration, hard usage, etc., cannot loosen and cause this compound to fall out.

J-M Ferro Compound is literally a powdered iron compound. It is mixed with water to the consistency of stiff putty and applied with a trowel or by hand. Being the color of iron, repairs made with it cannot be detected. Can be finished with a file or emery wheel like the rest of casting.

Write nearest Branch for Booklet.

H. W. JOHNS-MANVILLE CO.

Manufacturers of Asbestos and Magnesia Products — ASBESTOS — Asbestos Roofings, Packings, Electrical Supplies, etc.

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FREE

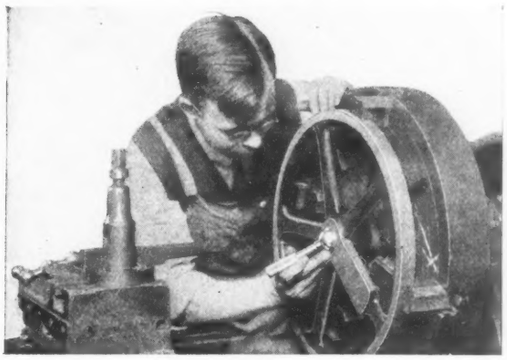
Send for my catalogue, showing 12 complete tables, giving the weights of Angles, Channels, I Beams, C. I. Columns, C. I. Plates and Steel Plates. The weights of Angles, Channels and I Beams are given from 1-inch to 40 feet in length. C. I. Columns from 1-inch to 31 feet, steel plate from 1 tenth (.1 square foot) to 600 square feet.

My system is a great saver of time and worry in estimating bills of material and the checking of invoices; it should be in the hands of every manufacturer of structural steel or tank work, mechanical engineers, structural draftsman, purchasing agents and dealers in iron and steel.

12 TABLES ABSOLUTELY FREE—SEND FOR THEM TODAY

Send 25 cents in stamps for my Cast Iron Plate Chart, giving the weights of plates from 6 x 6-inch to 28 x 28-inch square and for all the intermediate rectangular shapes, ranging from ⅜-inch to 2½ inches in thickness. Every machinist and machine shop should have this chart.

STRUCTURAL CARD INDEX SYSTEM
E. R. MONROE, Manager
512-513-514 Phoenix Block BAY CITY MICH.



"A little more yet."

Use Ball Gauges—
Save Time and Money

Mechanics work closer to limit dimensions, without fear of excess, when they use a ball gauge, for the "round" of the ball guides them as they work up to its final diameter—the desired measurement.

ATLAS
Ball Gauges

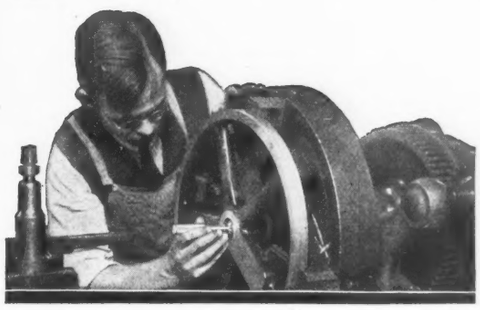
are made by electrically welding an ATLAS Ball to a knurled handle by a special process. They are guaranteed accurate within 1-10,000 of an inch.

Atlas Ball Gauges cost two-thirds less than plug gauges and give better service.

Send now for Ball Gauge Bulletin:

It describes ATLAS Ball gauges in an interesting way and shows you how to get better results in less time for less money.

Atlas Ball Company
203 Glenwood Avenue Philadelphia



"Just right."

"HAWK SPECIAL" TOOL STEEL Will Give You the Cut You Want

For making a fine finishing cut and taking a light chip, "Hawk Special" is far superior to the best High Speed Tool Steel at one-half the cost.

Where the speed is not excessive, "Hawk Special" will take the place of any High Speed Steel to good advantage.

STEEL OF EVERY DESCRIPTION

HAWKRIDGE BROTHERS COMPANY, 303 Congress Street, Boston, Mass.

Line Shaft Losses Will be Cut to the Limit by using

DIXON'S Graphite Cup Grease

Which relieves all tight, hot-running bearings by coating them with a practically frictionless, unctuous graphite surface and saves the power otherwise wasted in the friction of hard-running bearings.

Let us send the booklet "Graphite as a Lubricant," No. 74.

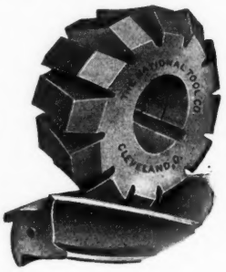
Made in JERSEY CITY, N. J., by the

JOSEPH DIXON CRUCIBLE CO.

"National-Cleveland" Milling Cutters Don't "Show their Age"

You can use a "National-Cleveland" Milling Cutter as long as the life of an ordinary cutter and then start all over again with the same tool.

Good service combined with ability to run at high speeds and still retain their cutting edges put "National-Cleveland" Cutters in the "Special Mention" class.



We manufacture Plain and Side Milling Cutters, Metal Slitting Saws, Angular Cutters, End Mills, Inserted Tooth Milling and Forming Cutters and special cutters on order.

Send for catalogue.

THE NATIONAL TOOL COMPANY Cleveland *Sixth City*

Chicago Salesrooms: 24 South Jefferson Street.

Nothing to Do but Drive

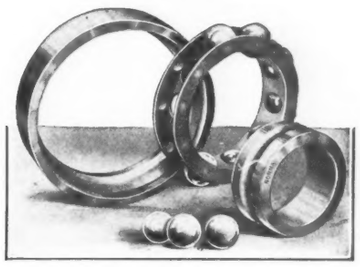
You are not put to the trouble of filing and fitting when you use our Finished Machine Key. We finish them *complete*—all ready to drive, and you can always depend upon accurate machining and true size. We have special facilities for making Machine Keys any length, width, depth, style or taper. If your keys are costing too much—get our prices.

Our specialties include: Machine Racks, Cold Drawn Shafting, Screw Stock, Flats, Squares, Hexagons and Special Shapes. Send for interesting Catalog.

STANDARD GAUGE STEEL COMPANY, Beaver Falls, Pa., U. S. A.

BRANCH OFFICES: Chicago, Ill., and Philadelphia, Pa. Pacific Tool and Supply Co., San Francisco, Cal. Dilworth Lockwood & Co., New York. R. B. Ridgley, Detroit, Mich. A. L. Maeder Co., Portland, Ore. Hall & Pickles, 64 Port St., Manchester, England.

NO class of service tests more severely the quality of a ball bearing than high-speed operation. In such service irregularities and mechanical imperfections, which are of no consequence in low-speed duty, are magnified by the speed to proportions causing immediate trouble and early failure.



OBVIOUSLY, the remedy lies in eliminating, or at least minimizing trouble-making possibilities in the bearing design. Among these are: vibration, excessive internal friction and lack of quality in materials and workmanship; for high sustained, as well as high initial, efficiency is essential.

High Speed Ball Bearings

REALIZING this, the Norma Company has devoted years to the production of a ball bearing having dependable high-speed qualities. Norma Ball Bearings represent the utmost refinement of design and construction applied to the problem of securing and maintaining high efficiency at high speed.

MANY exclusive features contribute to the success of the Norma Bearing in speed service: rigid mounting, prohibiting wear of housings or radial looseness of outer races; bronze or brass retainers guiding the balls by polar contact, with minimum wear; high precision maintained, preventing chattering and vibration and facilitating application.

APPLICATIONS of Norma Ball Bearings in a great variety of high-speed duties have met with entire success, conclusively proving the exceptional fitness of this bearing for such service. If you have a high-speed bearing problem the Norma High Speed Ball Bearing will solve it.

The Norma Company of America

24-26 Vesey Street NEW YORK

JESSOP'S "ARK" HIGH SPEED STEEL

Has an Unexcelled Record.

Note the Following Facts.

In turning 100 railway car wheel tires, Jessop's "Ark" High Speed Steel has the record of losing less steel, due to grinding, than any other make.

The actual amount of steel ground off the tool in turning 100 wheels was 3 ounces. This is an unrivalled performance in steel economy.

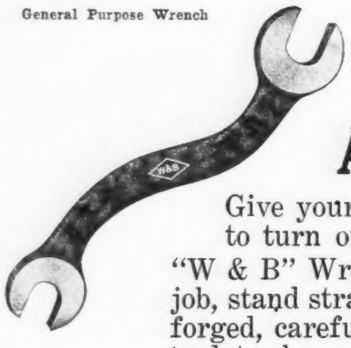
We have a large stock of Carbon Tool Steel and High Speed Steel. Write for Catalogue.

WM. JESSOP & SONS, Incorporated

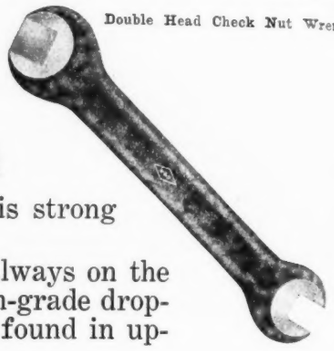
91 JOHN STREET, NEW YORK, N. Y.

Boston Warehouse: 163 High Street. Branch Warehouses throughout the United States.

General Purpose Wrench



Double Head Check Nut Wrench



"W & B" Wrenches Arouse Enthusiasm

Give your men good tools and the incentive is strong to turn out good work.

"W & B" Wrenches never disappoint. They're always on the job, stand strains that would break any but a high-grade drop-forged, carefully constructed wrench and will be found in up-to-date shops everywhere.

"W & B" Wrenches are thoroughly inspected before shipment—we will cheerfully refund the purchase price of any "W & B" wrench which proves defective in materials or workmanship. The "W & B" trade mark is a wrench insurance.

Write for Machinists' Supply Catalog 82D.

Bull Dog (Alligator) Type Wrench

W&B

TOOLS OF QUALITY BEAR THESE MARKS

W B

The Whitman & Barnes Manufacturing Company

ESTABLISHED 1854

General Office, Akron, Ohio, U. S. A.

NEW YORK STORE, 64 Reade St.

Factories, Akron, Ohio; Chicago, Ill.; St. Catharines, Ont.

European Office: 149 Queen Victoria St., London, E. C.

Export Sales Agent: A. J. Barnes, 90 West St., New York City.

Single Head Set Screw Wrench

PLANT No.1. BERLIN, GERMANY.

BALL ~ BEARINGS

HB DWF

H-B ball-bearings are the outcome of costly laboratory experiments, aimed to determine the most efficient, durable anti-friction bearing. That we have accomplished our aim is assured by the ball-bearings themselves. Try some and prove the truth of our statements.

Use H-B bearings for machine tool purposes. They make high speeds possible; their oil-tight and dust-proof qualities are invaluable, especially in grinding and buffing machines; and they are savers of friction and wear everywhere. Information cheerfully furnished for the asking.

The Hess-Bright Manufacturing Company

Pioneers in the introduction of Annular Ball Bearings

Most extensive resources and plants in existence devoted exclusively to ball bearing manufacture.

Main Offices and Plant No. 2 on line of Penna. R. R. to New York

No. 17 E. Erie Ave., Philadelphia, Pa.

HESS BRIGHT HB

PLANT No.2. PHILADELPHIA, PENNA.

HESS BRIGHT HB

"Becker"—the Service Stamp on Milling Cutters

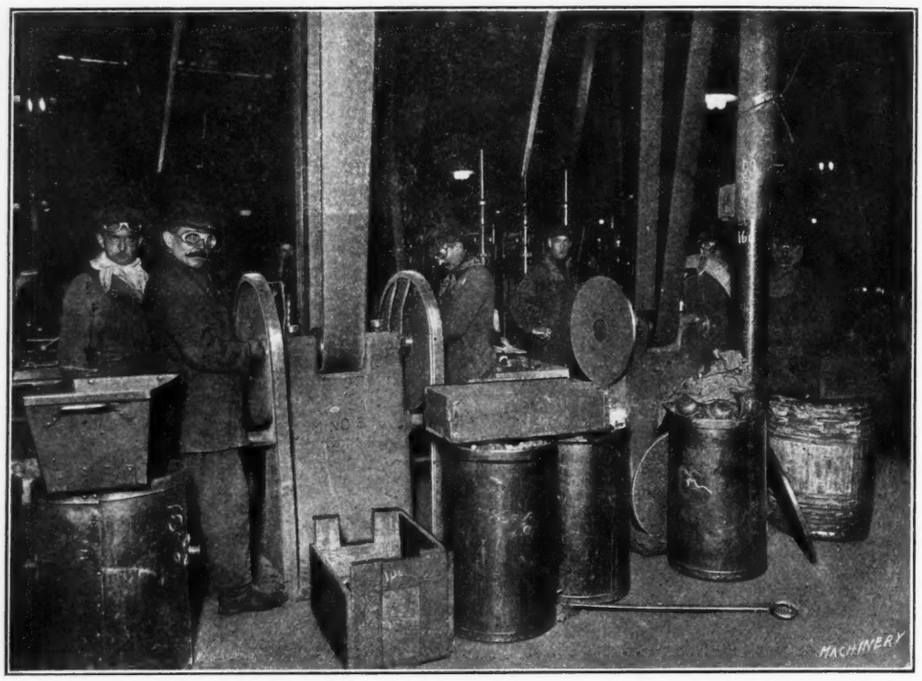
Are you sure of the service your milling cutters will give at the time you purchase them? Specify Becker Milling Cutters and be assured of accurate, fast, durable, thoroughly satisfactory cutters.

Improved form of tooth allows more room for chips; lessens the strain on cutting edges and is best suited for taking cuts at high speeds and feeds.

All Becker Cutters are fully warranted, for only the best high-speed steel, hardened by modern processes, is used; and the workmanship cannot be surpassed.

Send for a copy of our new catalog which illustrates special Becker Milling Cutters for use in Vertical Milling, Die Sinking and Profiling Machines. You'll find our Standard Cutters listed there too. Better write.

BECKER MILLING MACHINE CO.
HYDE PARK, MASS., U. S. A.



GARDNER DISC GRINDERS

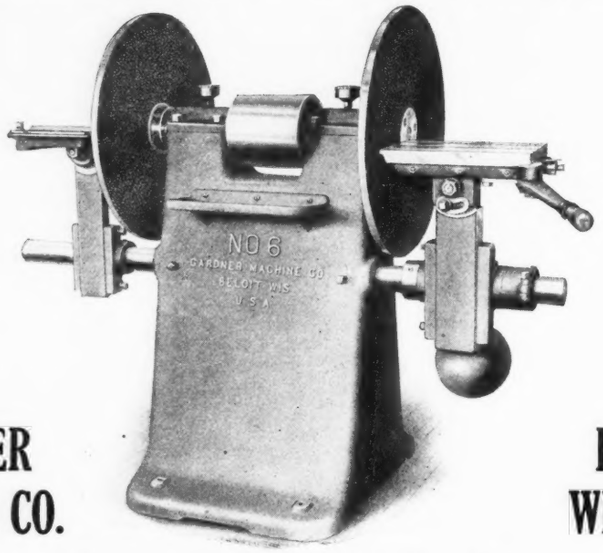
In the Ford Shops

Of course the "Gardner" is used in the Ford Shops. It is used in every shop where economical manufacture is essential. It fills a distinct, ever broadening need—and is saving time and money this very day for hundreds of manufacturers who have arranged their work for "Gardner" finish.

It is adaptable to a varied line of manufacturing—for finishing rear-axle housing flanges, gear cases and many other parts—and for similar work in other fields. Accurate finish and low costs are the advantages offered.

The one way to determine "Gardner" output definitely on your work is to let us do some of that work for you, here in our factory.

Our Experimental Department is at your service. Ask for specific information about our guarantee to increase outputs on suitable work from 3 to 30 times faster than by ordinary methods.

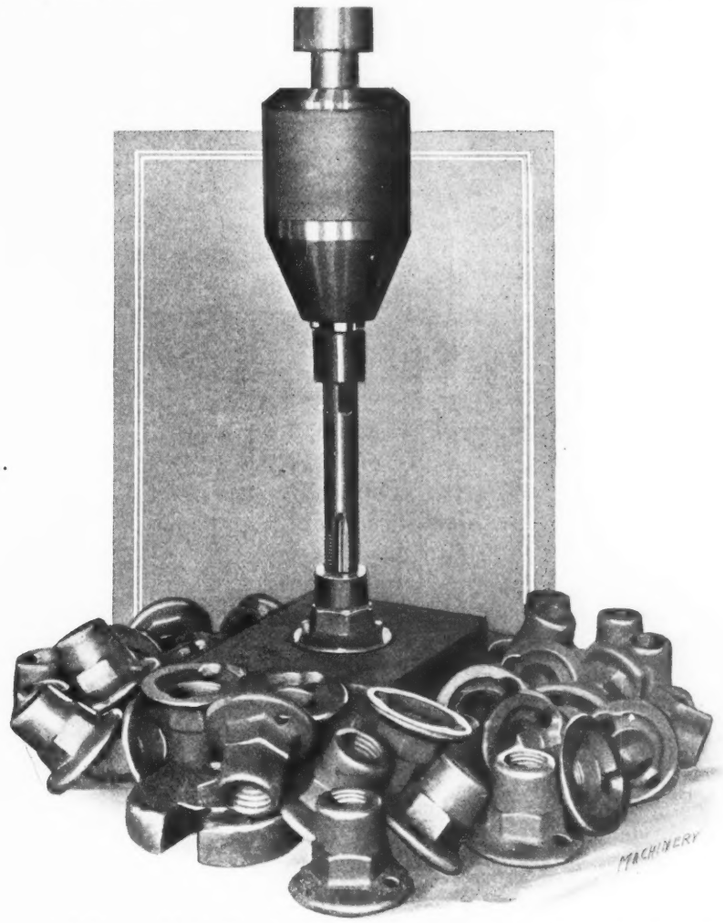


GARDNER MACHINE CO. **BELOIT, WISCONSIN**

The Disc Grinding Authorities

THE COIT BALL BEARING DRILL CHUCK
TAPPING

NEW uses for Coit Chucks are continually coming up—the latest is tapping. This is the process: A socket is provided with a square recess to fit the tap shank and this socket, which holds the tap loosely, is held in the "Coit." The tap is "lead" through the cast-iron nuts and drops out the under side—a simple operation, but one which requires an unusually powerful chuck to drive the tap without slipping. It is in such a role as this that a "Coit" shows its good qualities. Once gripped in the jaws of a "Coit," a drill or tap can't slip. The harder you crowd it the tighter the chuck grips and when you want to release it the only key required is your hand.



Unnecessary delays add to the cost of production. Don't waste time hunting for a chuck key. Learn the Coit "combination"—a turn of the hand.

When you're ready to talk "Coit" with us, let us hear from you —and we would suggest an early date, for your own benefit.

NARRAGANSETT MACHINE COMPANY
PROVIDENCE, RHODE ISLAND, U. S. A.
Engineers and Machinists

30,000 POSSIBLE CUSTOMERS "RIGHT UNDER YOUR NOSE"

If your goods are on exhibition at the Eighth Annual Foundry and Machine Exhibition in Chicago's Great International Amphitheater Building, from October 10th to 17th, 1913. More than one hundred and forty manufacturers of machines and equipment for the Machine Shop, Foundry, Pattern Shop and Power Plant, have secured space already; but with an available floor space of 75,000 square feet, exclusive of aisles, there is room for all. "First come first served," so it will pay you to reserve the choice spots ahead of time.

Previous exhibitions have been a marked success. They have paid from an actual sales standpoint. Exhibitors of these earlier shows were the first to make reservations for this one.

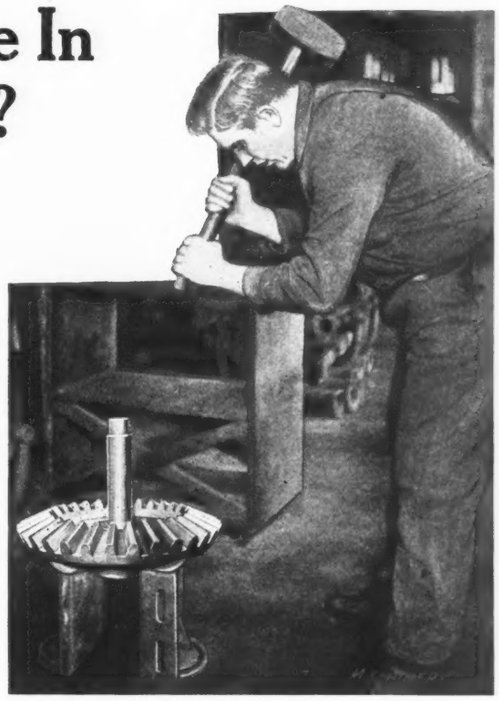
Managers, Superintendents, Foremen — the "men higher up" — attend these Exhibitions, for they recognize the benefits derived therefrom.

At this great annual gathering you meet customers, friends and competitors. You can feel the pulse of your market. You see the trend in design. You find out what the world is doing in your own and closely allied lines. Buyers will be here, we promise that—the sales you make will depend entirely upon yourself and your machines. Practically every progressive manufacturer in the country will have one or more representatives at the Exhibition. Will these buyers see *your* goods?

This Eighth Annual Exhibition will be the biggest thing of its kind ever carried through. Get in on the ground floor. Write today for prospectus, rates, floor plans and 1912 Registration List.

THE FOUNDRY & MACHINE EXHIBITION CO.
ROOM 206, HOTEL SHERMAN CHICAGO, ILL.
C. E. HOYT, SECRETARY

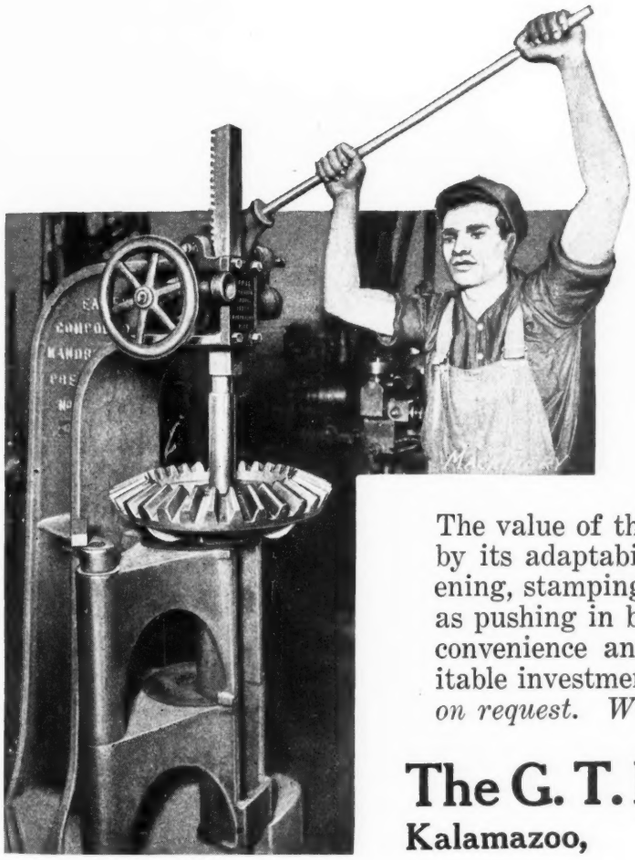
How Do You Drive In Your Mandrels?



Examine a worn-out, battered-up mandrel; the ridges and bumps are the result of "hammer radiation," misdirected force of s l a n t i n g blows.

Here's a camera story taken in the William Ganschow Shop, Chicago, Ill., which illustrates the old and the new way of driving mandrels. Flat centers, marred sides and expensive replacements are the invariable result of the hammer drive; that's why this company now uses

EAMES
Mandrel Presses



The Power from the Press

goes straight d o w n; there's no shock or side-swipe. Both the hole and the mandrel are kept true, so that the work is t u r n e d out faster and with greater accuracy. Ordinary leverage is increased five times by simply pressing in a one-inch pin. One to twenty-five tons pressure is easily obtained.

The value of the Eames Press is increased by its adaptability to broaching, straightening, stamping and bending work, as well as pushing in bushings. First cost is low, convenience and durability high; a profitable investment for any shop. *Catalogue on request. Write today.*

The G. T. Eames Company
Kalamazoo, Michigan, U. S. A.

RIVETING COSTS REDUCED

IT'S THE ELECTRIC WAY

It's 60% to 90% cheaper than riveting
It's 60% stronger than riveting
No holes to punch—No rivets used

One manufacturer recently installed a "Toledo" welder. The *machine and one inexperienced boy replaced five men doing the same riveting job.* The electric current costs less than the rivets formerly used, and it's a smoother and better job.

Send us samples—it's no trouble for us to weld them and costs you nothing but postage or express charges. We can then give you figures that will allow you to determine how many men *you* can lay off.

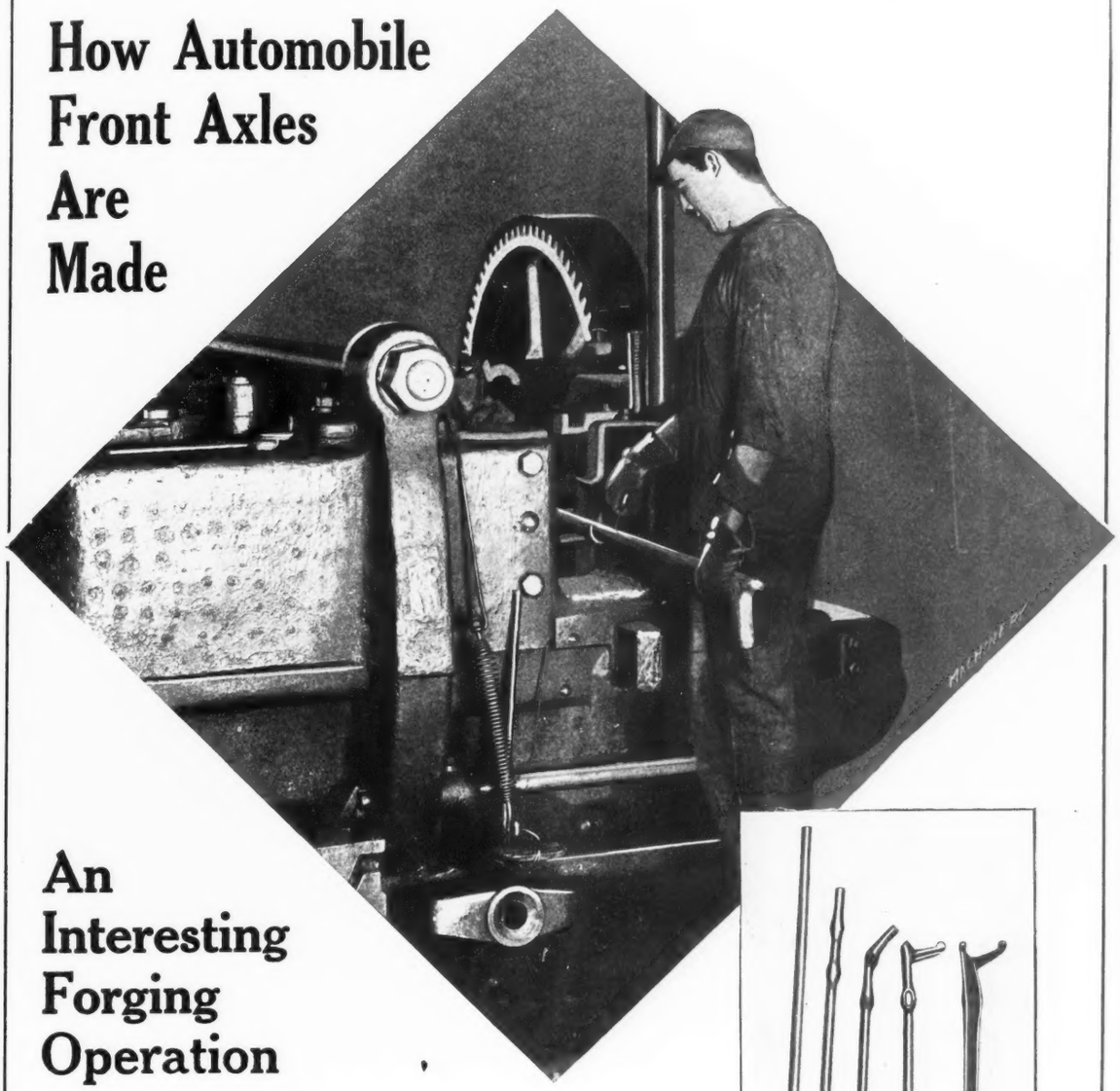
NO LEASE NO LICENSE NO ROYALTY

Free Bulletins—Just Ask for Them They Tell All About Welders

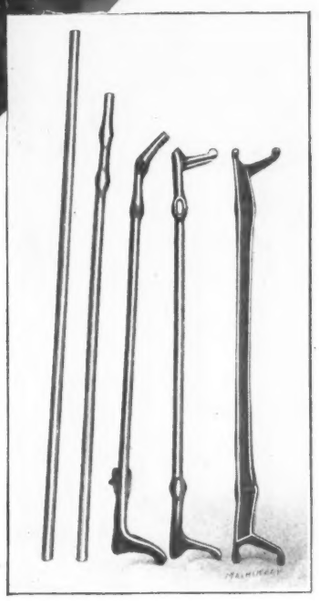
THE TOLEDO ELECTRIC WELDER COMPANY

Langland and Knowlton Sts. CINCINNATI, OHIO

How Automobile Front Axles Are Made



An Interesting Forging Operation



This illustration shows a National 3½-inch Forging Machine upsetting the front axles for one of the best known automobiles manufactured in the United States.

The axles are forged from vanadium steel; and the successive upsetting and forming operations through which this axle passes are shown in the illustration on the right; the axle being finished under a drop hammer.

National Heavy Pattern Forging Machines

have large gathering capacity; powerful gripping pressure, big die opening; equipped with the most improved safety devices and built throughout to meet the requirements of the present-day Automobile, Railroad and Industrial Forge Shop.

Send us blueprints or samples and let us show you the economy of handling your work on the National Forging Machine.

Built in 2, 3, 3½, 4 *and* 5 *inch sizes.*

THE NATIONAL MACHINERY CO
TIFFIN, OHIO, U.S.A.

Originators of modern Bolt, Nut and Forging Machinery.

Parts that are Practically Self-assembling and Finished in the Shortest Time Make for the Greatest Economy

These Data from a Large Automobile Axle Factory, Showing how One Gisholt Turret Lathe Does the Work of Four Drill Presses and Two Boring Mills, may have a Bearing on your Manufacture

Piece is a Rear Axle Gear Case. Extreme inside diameter of dowel fit, 10.735″, with a limit of .001″. First bore in center of piece, for holding ball bearing, has a diameter of 3.375″ and length 2.5″. Limit of variation .0005″ for this bore. Second bore has a diameter of 2.663″ and length .8125″. Smallest bore has a diameter of 2.482″ and length 3.5″. Note gauge on top of pieces used for measuring depth from face of outer rim to end and bottom of bore, the limit being .001″.

How Six Machines Did the Work

Gear Cases were machined in halves, each half being first placed in a chucking fixture.

Four drill presses were operated for drilling the holes of various diameters, the half case with its fixture being passed from one press to the next in sequence.

In the Boring Mill operations the half case was placed upon a stub expansion arbor, whereupon the outer edge was faced and the fit bored or turned for the male or female half, respectively.

Assembling the halves at this stage found them out of alignment from .005″ to .020″.

In order to machine the remainder of the gear case (at point of connection of propeller shaft housing) it was necessary to insert an arbor, fitting the bore within .002″. Before this arbor could be inserted, however, the two halves must needs be connected and line-reamed, involving the entire time of six men and an excessive outlay for line-reamers.

By this method the floor to floor machine time for finishing each half case, exclusive of line-reaming, was seven and three-quarter minutes and demanded the full time of three men.

How One Gisholt 21" Lathe Does the Work

The greater accuracy attained by the use of the

GISHOLT 21" TURRET LATHE

here shown eliminates the expense and time of line-reaming entirely.

One man and one Gisholt finish the gear case halves here shown in seven and three-fourths minutes, the exact time required in the machine operations alone under the former system. A distinct saving in time, men, machines and floor space.

It is to be noted, further, that while the average production of gear case halves on this Gisholt Lathe is six pieces per hour, exhibition runs by the user have *reduced this time to four minutes each, floor to floor.*

Cut B-13-A shows the gear case parts assembled. Paper has been placed between the two halves at the bosses to test their alignment. A master gauge, .002″ smaller than the bore of the work is now run through the halves and is revolved as freely as in a running fit.

Thousands of these gear cases have passed most rigid inspection.

Send for a Gisholt Field Engineer to Make Sure Your Operating Time is at the Minimum

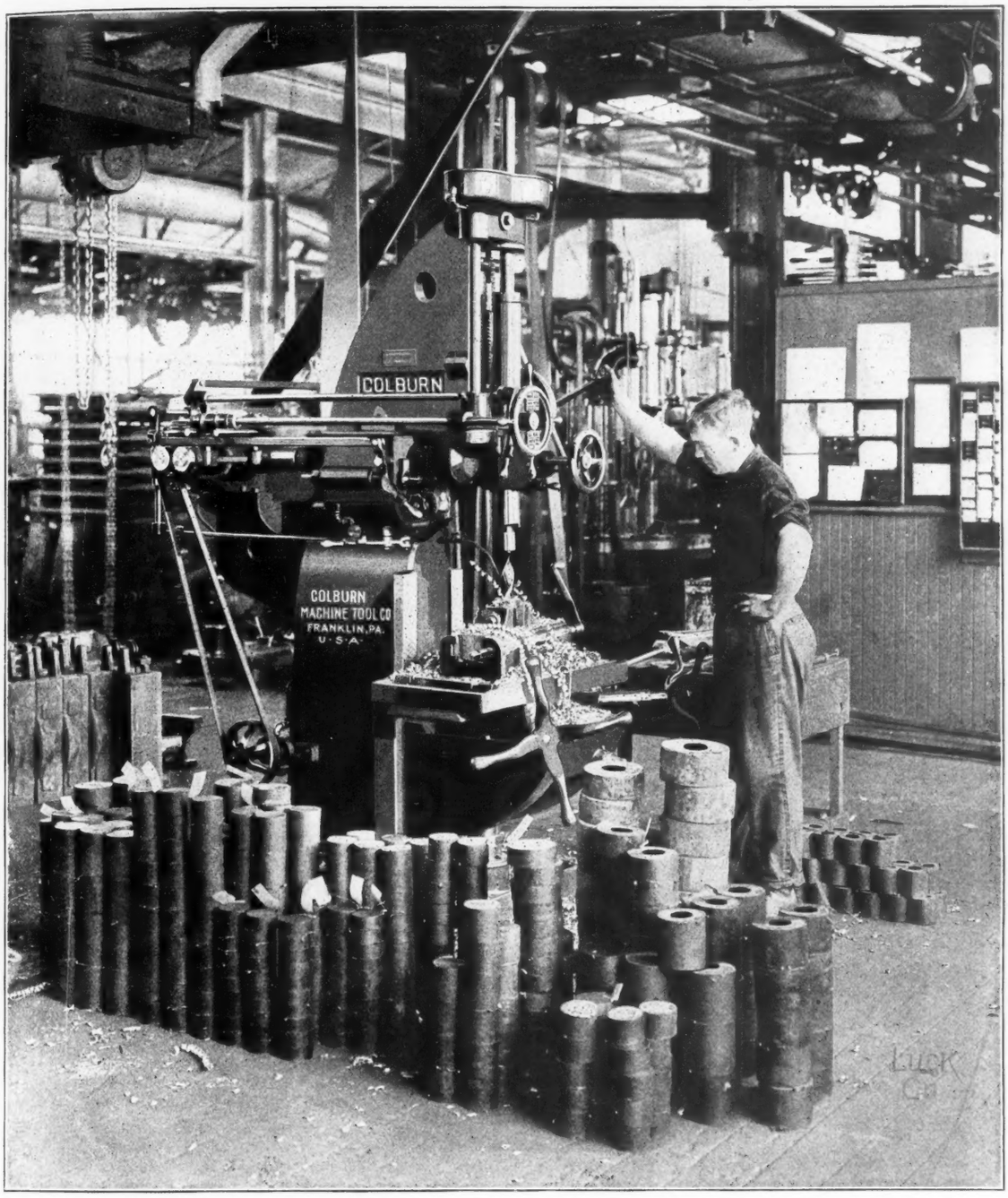
GISHOLT MACHINE COMPANY

Manufacturers of Turret Lathes, Boring Mills and other Labor-Saving Machines

MADISON, WISCONSIN **New York Office, 50 Church St**

FOREIGN AGENTS: Alfred H. Schutte, Cologne, Berlin, Brussels, Liege, Paris, Milan, St. Petersburg, Bilbao, Barcelona. Donauwerk Ernst Krause & Co., Vienna, Prague and Budapest. C. W. Burton, Griffiths & Co., London, England. Andrews & George, Yokohama, Japan.

COLBURN DRILL PRESSES



This is the way gear blanks and similar work are brought to a Colburn Drill Press. The reason is plain. It's because a Colburn will drive drills at higher speeds and coarser feeds than is possible on any other machine built. The certain results are greatly increased output and lower costs, and that is what counts.

The remarkable success Colburn drills have attained wherever installed is due to their wonderful power, stiffness and ease of control.

A mere glance at this massive arched column machine, which typifies the utmost rigidity, equipped with all steel gears running in oil, massive knee, Hess-Bright thrust spindle bearing, etc., is sufficient to convince any one that it will do vastly more work and last longer than any other type of drill press, no matter how stiff or how well made.

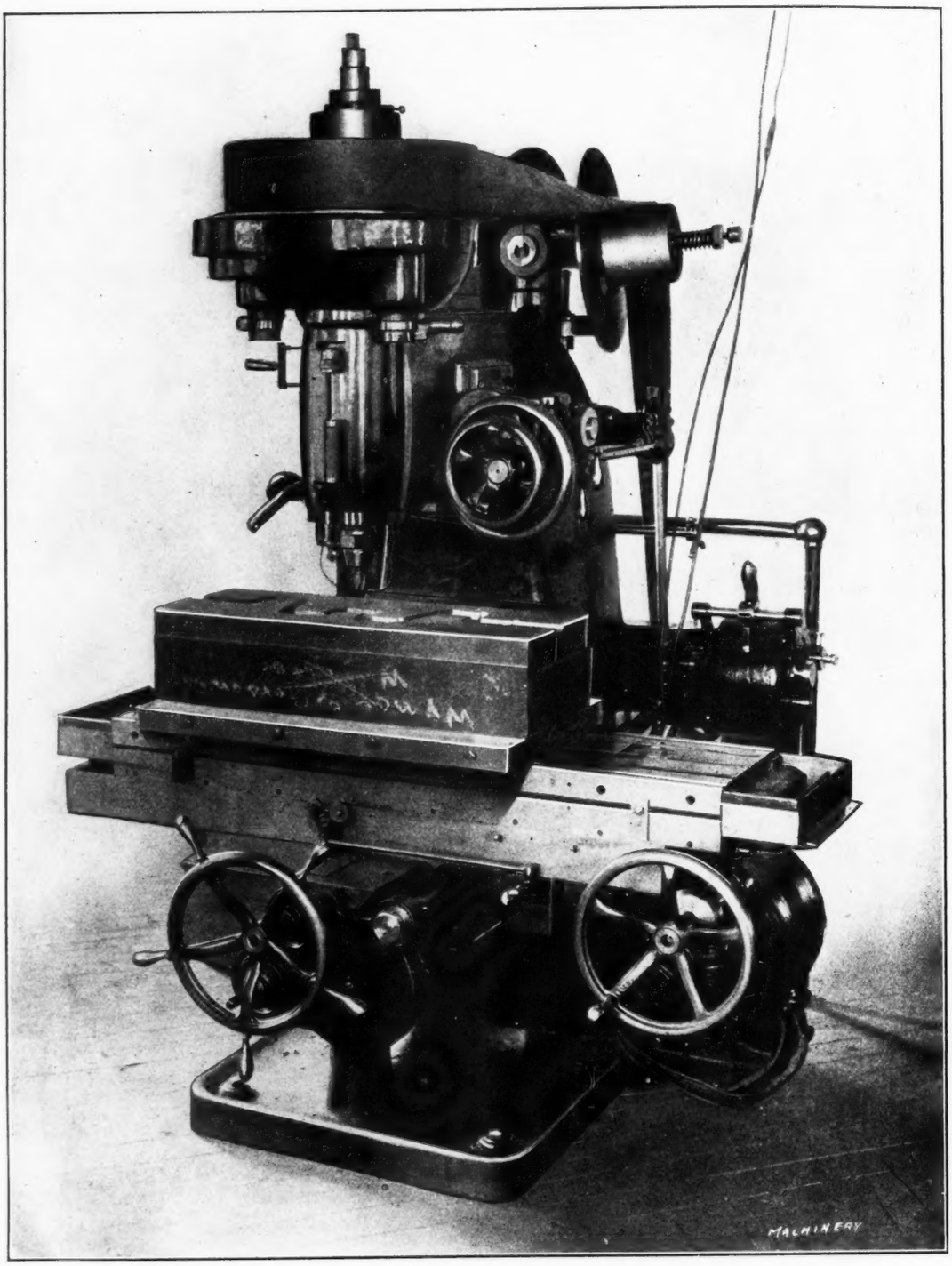
We can show you how you can do more work, and thereby quickly note a big saving in shop cost, whether it be punching holes in gear blanks or doing any other kind of drilling.

Get in touch with us—write for our bulletins—send us your blueprints and let us help you solve your drilling problems.

COLBURN MACHINE TOOL COMPANY, Franklin, Pa.

FOREIGN AGENTS: Schuchardt & Schutte, Berlin, London, Vienna, St. Petersburg, Stockholm, Prague, Tokio.

"Heavyweight" Drop Forge Die Sinking



Becker Milling Machine Company,

AGENTS: Niles-Bement-Pond Co., New York. H. B. Slate, Hartford, Conn. National Supply Co., Toledo, Ohio. Rumley-Wachs Machinery Co., Chicago. Selen
Shanghai, China; Tokio, Japan. Allied Machinery Co. of America.

on the Becker Vertical Milling Machine

Heavy Cuts in Heavy Work—and a Heavy Machine to Take Them

The "Model C" Becker Vertical Milling Machine has them all beaten when it comes to drop forge die-sinking—especially when the dies weigh a thousand pounds and upward, such as they make at the Wyman & Gordon Co.'s shop, Worcester, Mass.

Look at the column of this machine—sturdy enough to stand any cutting action you can put upon it. Look at the drive—the heavy belt that drives the cutting spindle—capable of driving any cutter you put in the spindle. Then the spindle carrier feature is a point you should be familiar with.

The advantages of operating a milling machine on heavy cuts without back gears in mesh, is too well known to need enlarging upon. The "Model C" Becker will handle all average work without spindle gears in mesh—another reason why this tool is one of the most remarkable producers in the milling machine field.

The open belt drive affords unusual power and strength as well as flexibility, the machine is simple and convenient with quickly operated speed and feed changes adjustable *under cut.* There are other features too, many of them exclusively "Becker," which you should know about.

If you have heavy vertical milling of any kind, a Becker Vertical Milling Machine is the best asset you could have. Let us send you facts and figures to back up this statement.

Hyde Park, Massachusetts, U. S. A.

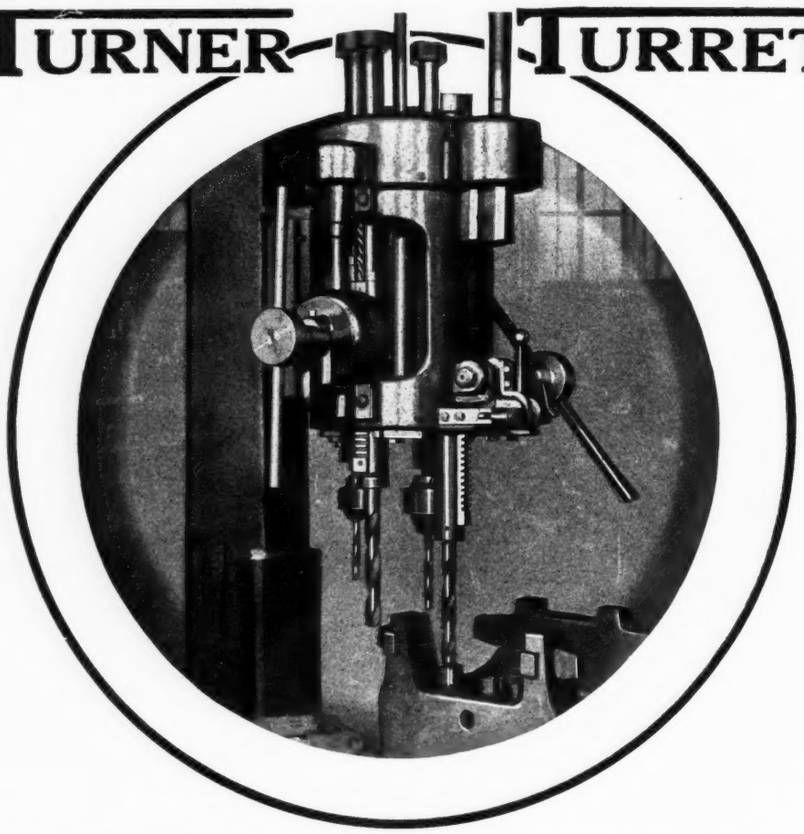
Engineering Co., Ltd., London, England. Schuchardt & Schutte, Berlin, Germany; Vienna, Austria, Stockholm, Sweden; St. Petersburg, Russia; Copenhagen, Denmark; Paris, France; Belgium; Holland, Portugal, Spain and Switzerland.

Cut Production Time in Half

Many spindles make light work. Old style single spindle machines waste time and usually necessitate several settings to drill one casting. The TURNER TURRET drills, counterbores, reams and taps without removing a tool and at one setting. Only the working spindle rotates and the power is concentrated at this point, giving maximum speed without waste.

Great care has been exercised in the design and construction of Turner Turret Drilling Machines. The spindles move through the turret and the indexing lever *accurately places each spindle in working position.*

TURNER TURRET



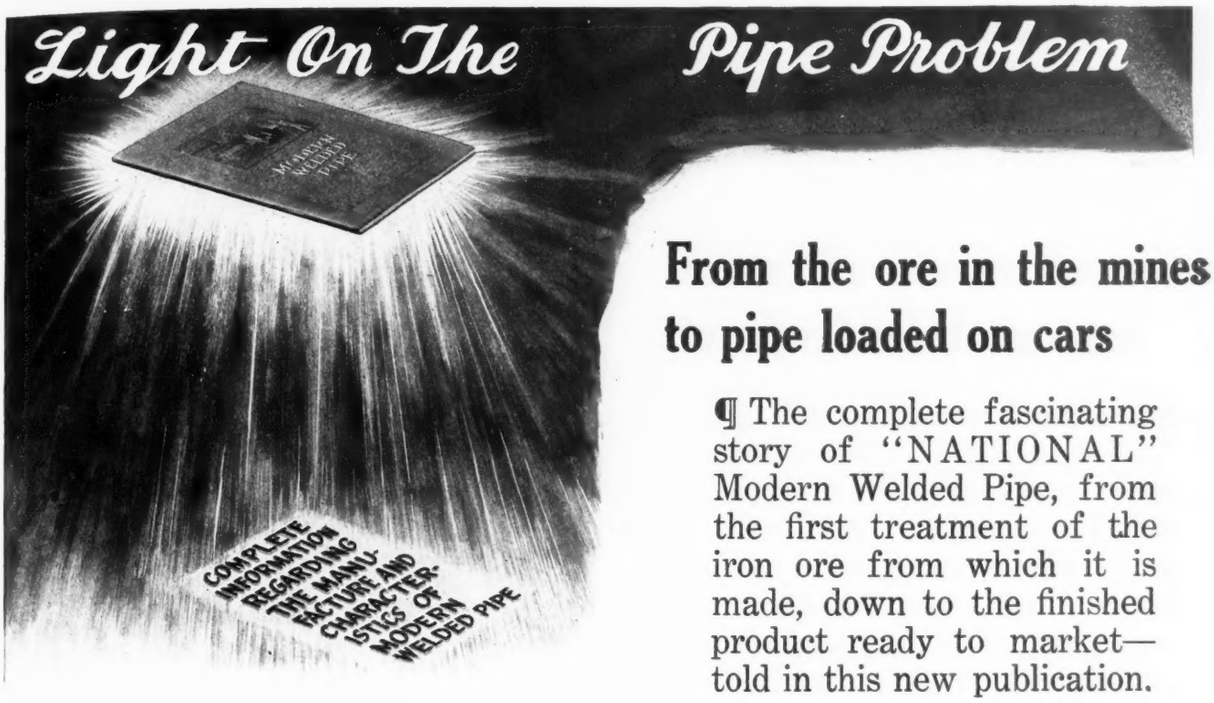
Feed is positive and may be changed without stopping the machine, a distinct advantage. The spindle has bearings at both ends. The thrust is taken at the lower end of the spindle, and thence transferred to the frame of the machine. There is no tendency to spring the spindle. Turner Turrets are built in twenty-four styles and sizes. Your inquiry will receive prompt attention.

Turner Machine Company

Founded 1859 — DANBURY, CONN., U. S. A. — and Newark, N. J. U. S. A.

Incorporated with Turner, Atherton & Co., Ltd., Denton, Manchester and Stockport, England

DOMESTIC AGENTS: Prentiss Tool & Supply Co., New York City, Buffalo, Rochester and Syracuse, New York, Boston, Mass., Scranton, Pa. Marshall & Huschart Machinery Co., Chicago, Ill., St. Louis, Mo. Motch & Merryweather Machinery Co., Cleveland, Ohio, Detroit, Mich. W. E. Shipley Machinery Co., Philadelphia, Pa. Robinson, Cary & Sands Co., St. Paul and Duluth, Minn. Hallidie Machinery Co., Seattle and Spokane, Wash. Dewstoe Machine Tool Co., Birmingham, Ala. Kemp Machinery Co., Baltimore, Md.



From the ore in the mines to pipe loaded on cars

¶ The complete fascinating story of "NATIONAL" Modern Welded Pipe, from the first treatment of the iron ore from which it is made, down to the finished product ready to market—told in this new publication.

"MODERN WELDED PIPE"

Free to every man who has legitimate use for it

¶ To readily identify "NATIONAL" material, and as protection to manufacturer and consumer alike, the practice of National Tube Company is to roll in raised letters of good size on each few feet of every length of welded pipe the name "NATIONAL" (except on the smaller butt-weld sizes, on which this is not mechanically feasible).

MARKING

Name Rolled in Raised Letters on National Tube Co. Pipe

¶ In addition, all sizes of "NATIONAL" welded pipe below four or five inches are subjected to a roll-knobbling process known as "Spellerizing" to lessen the tendency to corrosion, especially in the form of pitting. This "Spellerizing" process is peculiar to "NATIONAL" pipe, to which process National Tube Company has exclusive rights.

¶ The booklet gives not only the story of "NATIONAL" Modern Welded Pipe manufacture, it also contains invaluable information about the characteristics and service of "NATIONAL" Pipe.

(1) For instance, there is a complete discussion of *pipe corrosion*—a most important subject about which little is generally known. The account in "MODERN WELDED PIPE" includes original data upon recent exhaustive tests, with final results summed up authoritatively and interestingly by the Director of the Research Department of the Massachusetts Institute of Technology.

(2) Summary of Bursting Tests of Commercial Tubes and Pipes, etc., etc.

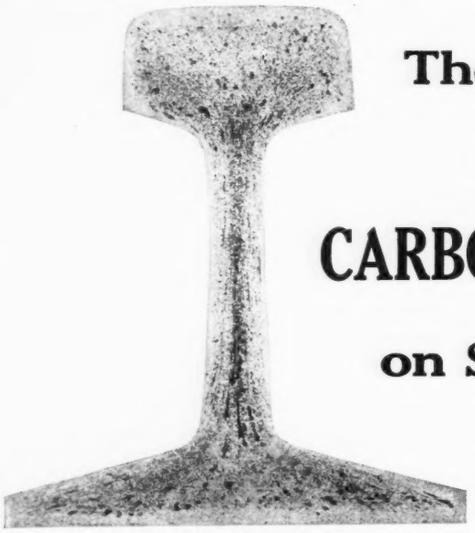
¶ This booklet has thirty-two pages, handsomely illustrated in two colors, with tables and diagrams.

If you have a Real Interest in and want Real Light on the Pipe Subject write NOW—for this Booklet.

NATIONAL TUBE COMPANY

General Sales Offices, FRICK BUILDING, PITTSBURGH PA.

DISTRICT SALES OFFICES:
Atlanta, Boston, Chicago, Denver, Kansas City, New Orleans, New York, Philadelphia, Pittsburgh, St. Louis, St. Paul, Salt Lake City.
PACIFIC COAST REPRESENTATIVES: U. S. Steel Products Co., San Francisco, Seattle, Portland, Los Angeles.
EXPORT REPRESENTATIVES: U. S. Steel Products Co., New York City.

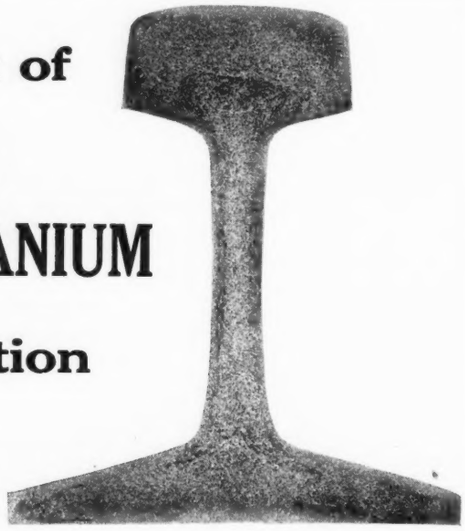


The Effect of

FERRO CARBON-TITANIUM

on Segregation

TPC
Reg. U. S. Pat. Off.
TRADE MARK.



Standard Open Hearth

0.10 Titanium Open Hearth

Titanium cleanses the steel and reduces segregation in the ingot. All steels can be improved by its use.

Titanium Alloy Manufacturing Company

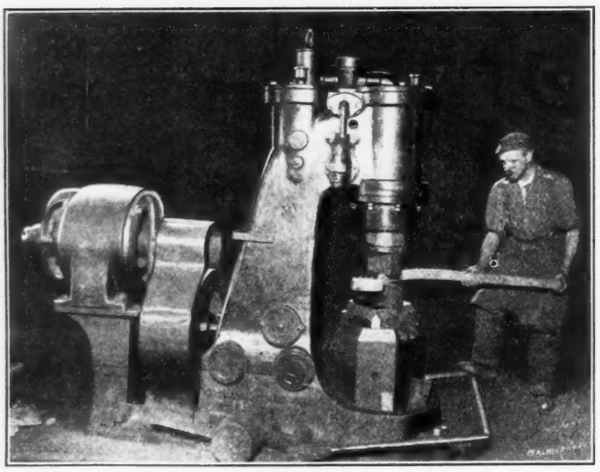
Operating Under Rossi Patents. Processes and Products Patented.

General Office and Works: NIAGARA FALLS, N. Y.

PITTSBURGH OFFICE: Oliver Building. CHICAGO OFFICE: Peoples Gas Building.

AGENTS: The Primos Chemical Co., Primos, Delaware Co., Pa. Pacific Coast Agents: Eccles & Smith Co., Los Angeles, Portland, San Francisco. Great Britain and Europe: T. Rowlands & Co., Sheffield, Eng.

AFTER FOUR YEARS' USE



Hammers from 66 to 770 lb. sizes (falling weight). Belt or Motor Drive.

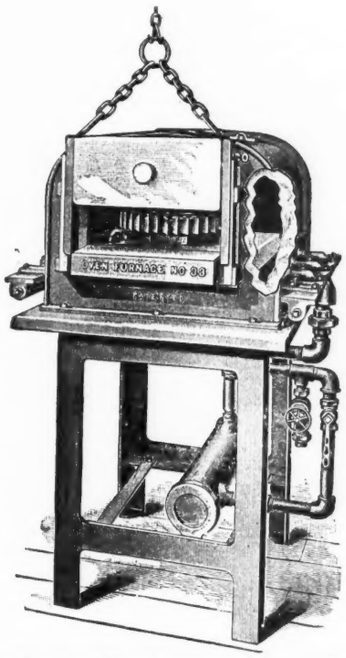
NAZEL ENGINEERING & MACHINE WORKS

4043 No. Fifth St. Philadelphia, Pa., U.S.A.

THE durability and adaptability of Beche Hammers has been proven conclusively by Schaum & Uhlinger, textile machinery builders, who have had a 165-pound size in constant operation for the past four years. They say in a recent letter: "The maintenance cost has been practically nothing up to date." Taking into consideration that some of the jobs forged are as large as $5\frac{1}{8}$" in diameter, this is a remarkable record, especially as the rated capacity of this size hammer is but 4" diameter.

What the Beche is doing for others it will do for you—satisfactory service not only today, but years hence, with the reflection that its first cost was its only cost.

Write for the Beche Catalogue.



Oven Furnace No. 38

For Hardening High Speed or Tool Steel Tools, Especially Milling Cutters.

MADE IN VARIOUS SIZES

American Gas Furnaces

are highly recommended by makers of high speed and tool steels. More uniform results are assured; perfect control of temperature to within five degrees is a distinct advantage; no fuel is better adapted for heating and tempering tools, dies, cutters and small machine parts.

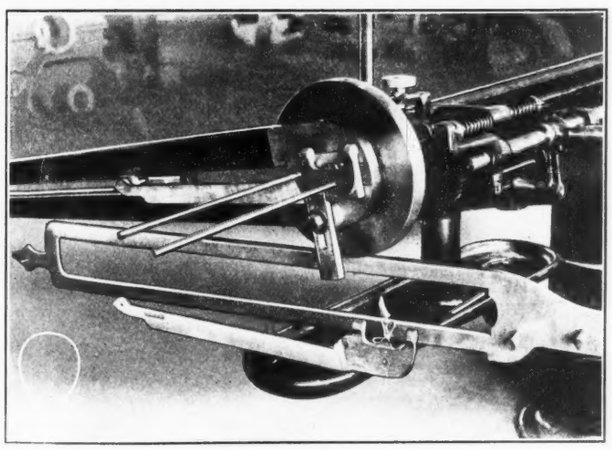
The cost of coal is soaring. Gas is cheaper than it used to be. Not the cheapest fuel in first cost; but its adaptability for heating metals, etc., makes it the most economical fuel for manufacturing.

Specify **"American"** when ordering your next Gas Furnace or Heating Machine. We carry a full line—would be glad to take the matter up with your buyer, either by mail or personally. Will you write?

American Gas Furnace Co.

24 John Street NEW YORK, U. S. A.

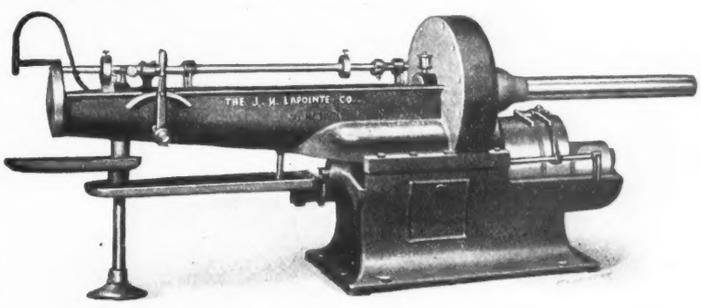
Don't Chip and File—Broach!



Actual size of pivot holes broached in scale beam.

There are a great many jobs that can be more advantageously handled by broaching than with old-time hand methods. One of the largest manufacturers of high-grade scales used to chip and file the oval holes into which the scale pivots were driven. He doesn't do it now—he puts the work on a J. N. Lapointe Broaching Machine, specially fitted for the job, and finishes it faster, better, and at a fraction of the cost of hand work. He has learned the value of broaching—whenever there's any chance to apply it.

How about your work? Of course not every piece can be broached; but we'd like to show you how wide a range of work we can handle—costs nothing to ask our advice.

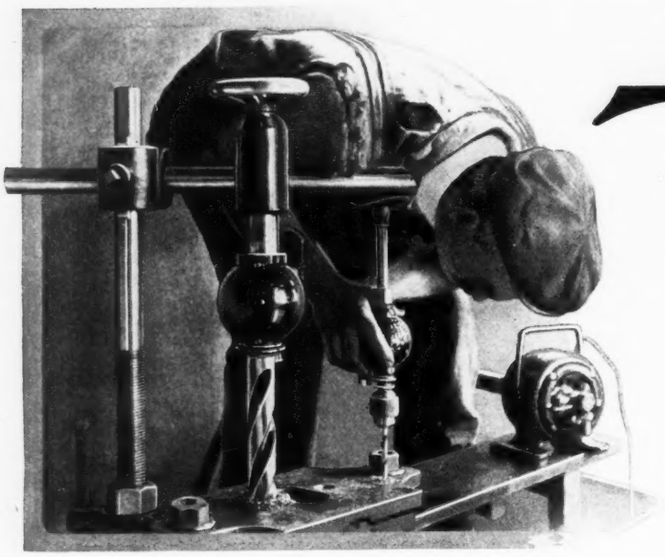


THE J. N. LAPOINTE CO.

NEW LONDON, CONN.

DOMESTIC AGENTS: Manning, Maxwell & Moore, Inc., Chicago, Philadelphia, Boston, St. Louis, Pittsburgh, Cleveland, Buffalo, Detroit, San Francisco, New York, Cincinnati, Los Angeles, New Haven.

FOREIGN AGENTS: Charles Churchill & Co., London, England. Lambercier & Co., Geneva, Switzerland. Henri Benedictus, Antwerp, Belgium. Schuchardt & Schutte, Berlin, Germany. La Maquinaria, Anglo-Americana, Barcelona, Spain. Mitsui & Co., Yokohama, Japan. General Supply Co. of Canada, Toronto, Canada. Glaenzer & Perreaud, Paris, France.



COATES Flexible Shafting is Efficient as well as Durable

We have photographed this 1-4 H. P. motor and Coates Flexible Shaft driving a 2″ and a 1-4″ breast drill respectively.

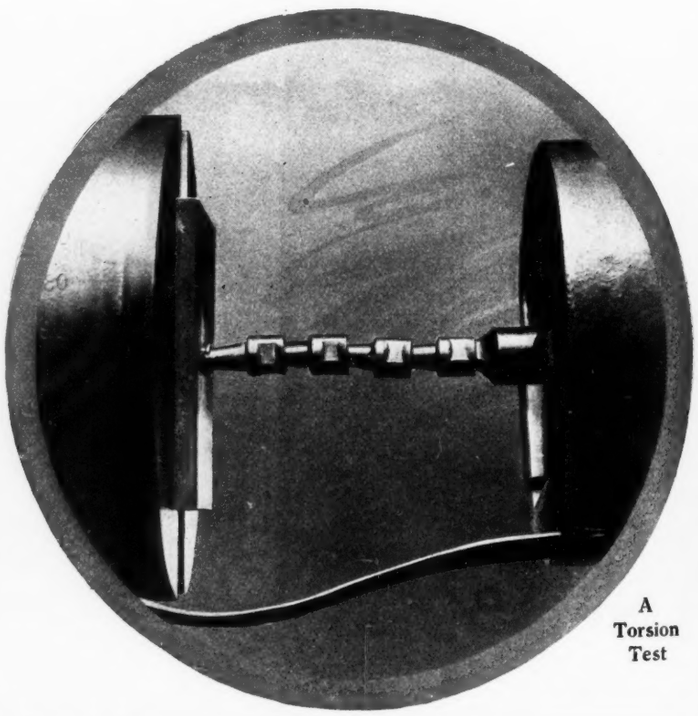
This is a smaller motor than would be recommended to drive a big drill in steady service, the illustration simply showing what can be done with a small "Coates" outfit if a large one is not available. A "Coates" Flexible Shaft delivers practically all the power of the motor directly to the drilling tool—it is an efficient method of transmission.

A "Coates" outfit is adapted to a multitude of uses throughout the shop—gets into corners, under machines, anywhere your arm will reach, and grinds, drills and polishes as well as any machine made especially for any one of these operations.

Coates Chrome Vanadium Flexible Shafting is strong and durable. We have proven by actual test that a link of our flexible shafting is from 8 to 9 times stronger than the greatest strain put on it in actual service.

COATES

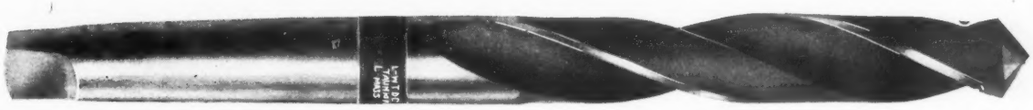
Test reports and figures will be sent on request, together with catalogue.



A Torsion Test

COATES CLIPPER MFG. COMPANY

WORCESTER, MASS., U. S. A.



"LINCOLN-WILLIAMS" DRILLS HAVE UNIFORM TEMPER

Granted that drills are made of the best steel obtainable, unless the centers are hard and unless that hardness extends to the outer cutting edges, the life of the drill is short.

In making "Lincoln-Williams" High Speed Drills we use the best Vanadium High Speed Steel, and by a special method of rolling, twisting and compressing make the centers as hard as the cutting edges.

Try them and prove it.

Our new Catalog shows all styles.

LINCOLN-WILLIAMS TWIST DRILL CO., Taunton, Mass., U. S. A.

Friction Can't Travel on a Baldwin Chain

Belts and gears are sometimes necessary, but they often waste power where a Baldwin Chain Drive would not only save it, but would increase the quality of the machine's output as well, by making its work uniformly accurate. For the Baldwin chain and sprocket action approximates true rolling motion, is practically frictionless and has extremely high mechanical efficiency. A "Baldwin" requires very little operating space, is unaffected by steam, oil or moisture. If working strain is heavy the chain can be made to suit.

Every day your belts slip and gears grind, you lose a certain amount of power—and power is money. Don't you think it's time to see how nearly your power bill represents actual work done?

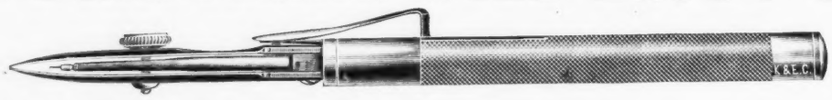
Our catalog has many facts and formulas that will help. Write for it.

BALDWIN CHAIN & MFG. COMPANY

WORCESTER, MASS.

AGENTS: H. V. Greenwood, 122 So. Michigan Boulevard, Chicago, Ill. C. J. Ivon, Rochester, N. Y. M. A. Bryte, 788 Mission St., San Francisco, Cal.

YOUR DRAFTSMAN WILL ENJOY USING



The Smith FOUNTAIN Drawing Pen

For it will enable him to work faster, without the annoyance of constantly refilling his pen. The reservoir is *self-filling;* the flow of ink is under absolute control; the blades are easily cleaned—they have an excellent *quick-opening device.*

Write for descriptive circular.

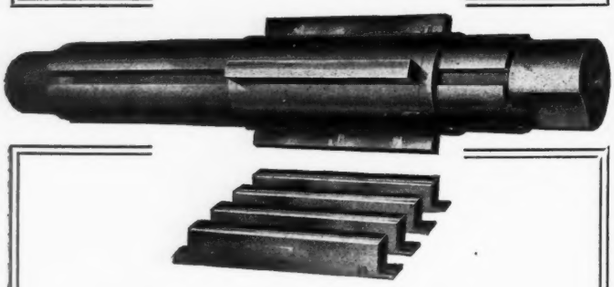
NEW YORK: 127 Fulton St.
CHICAGO: 68 W. Madison St.
ST. LOUIS: 813 Locust St.

KEUFFEL & ESSER CO.
Drawing Materials, Mathematical and Surveying Instruments, Measuring Tapes

SAN FRANCISCO: 48-50 Second St.
MONTREAL: 252 Notre Dame St., W.
HOBOKEN, N. J.: Adams and 3rd Sts.

What's Your Objection?

Why don't you use Nicholson Expanding Mandrels? Surely not because of cost—for the complete set of nine, taking all holes from 1 to 7 inches, costs less than solid mandrels of equal range. More than that, they are always ready, do not need heavy driving, never distort the work, wear for years and will save their price in time and money over and over again. What, therefore, is your objection?



Nicholson new catalogue on request.

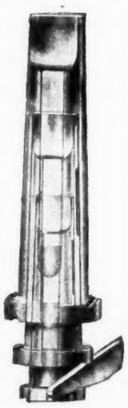
W. H. NICHOLSON & COMPANY

WILKES-BARRE, PA., U. S. A.

FOREIGN HOUSES: C. W. Burton, Griffiths & Co., London. Burton Fils, Paris. Alfred H. Schutte, Germany, Holland, Belgium, Switzerland, Italy, Spain, Portugal, Russia, Denmark, Scandinavia.

Cut Drill Costs With WEAR-EVER SOCKETS

Made from special steel, heat-treated — they outwear all others. We guarantee this. Standard Morse Dimensions inside and out; can be nested, not only with their own kind, but with those of other standard makes.



Wear-Ever Sockets assure positive drive, do away with twisted off tangs, use up old drills, save time and money. Finished work is right when the drill is guided in a "Wear-Ever" Socket.

We back up these claims. Order at our risk—you'll be satisfied. Sent on 30 days' free trial.

SCULLY-JONES & CO.

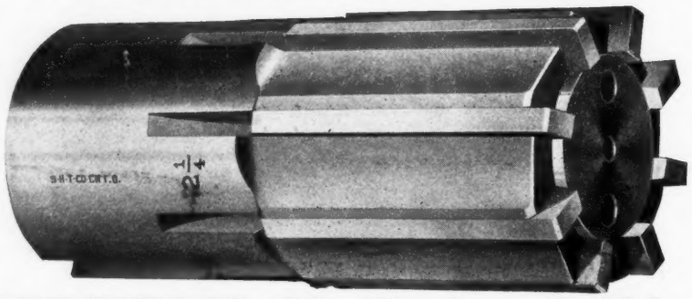
ENGINEERING MANUFACTURING and SUPPLIES

642 Railway Exchange Chicago, Ill.

THE ACME RIGID H. S. EXPANDING BLADE SHELL REAMERS

These reamers are made in sizes from 1" to 5" in diameter. They have Morse Taper Holes. Sizes from 1¼" in diameter up have ⅛" expansion.

The blades do not change their longitudinal position in the bodies. They can be quickly expanded to compensate for wear. The expansion of the blades is uniform and accurate. The expanding screws are hardened and ground. The design of the bodies provides for ample chip clearance. These reamers have the fewest possible parts with nothing to get out of order. Try one of these and save in the cost of your reaming.



THE SCHELLENBACH-HUNT TOOL CO., Cincinnati, Ohio

FOREIGN AGENTS: C. W. Burton, Griffiths & Co., London, England. Markt & Co., 193 West St., New York; Germany and Italy. New York Export and Import Co., 133-137 Front St., New York; China, Japan and Australia. Williams & Wilson, Montreal, Canada. J. S. Cock, Christiania, Norway.

"Reece" Screw Plates Insure a Tight Fit

"Reece" taps and dies take clean, smooth cuts, forming perfect threads in one operation. Correct designs eliminate dragging and burring.

Not only are "Reece" tools exceedingly accurate, it is not unusual for them to accomplish six times more work than common screw-cutting tools.

Quality through and through is the basis of "Reece" superiority.

F. E. WELLS & SON CO., Greenfield, Mass., U. S. A.

New York Office: 101 Reade Street Chicago: 57 West Lake Street

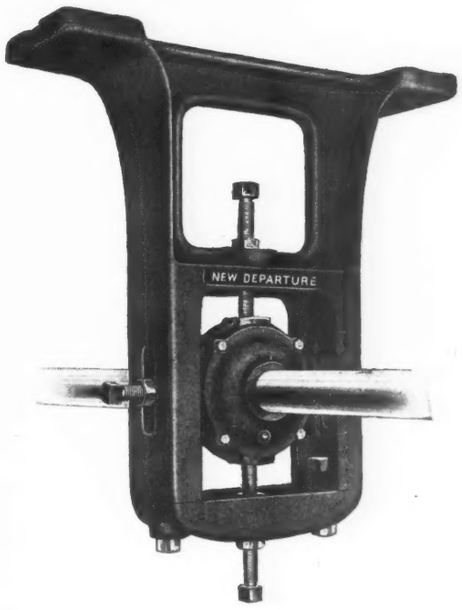
ARE YOU INFORMED?

The efficiency expert will tell you to install ball bearing hangers, by all means. But it does not need an "efficiency engineer" to show the actual money you can save by equipping your factory with

NEW DEPARTURE BALL BEARING HANGERS

It is simple, common sense that if your shafting runs without friction, dragging, hot boxes, etc., you are conserving your motor energy and economizing your power maintenance cost.

We know you are interested and want to go into this matter further with you. Write today for our literature which will discuss with you all of the advantages of this modern money-saving equipment.



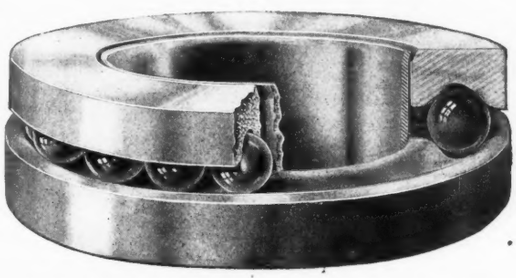
SEND FOR SPECIAL DATA SHEETS ON APPLICATION OF NEW DEPARTURE BALL BEARINGS TO MACHINE TOOLS.

The New Departure Mfg. Co.

Hartford Division: HARTFORD, CONN. **Main Office and Works: BRISTOL, CONN.**

Reduce Wear and Tear—Stop Lost Motion

Discard friction thrust washers which consume oil and even then often become overheated besides having to be renewed at intervals. Use



Auburn Self-Contained Style T-114 Ball Thrust Bearing

AUBURN BALL THRUST BEARINGS

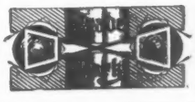
which last indefinitely, eliminating friction, wear and lost motion with practically no consumption of oil.

Write today about your difficulties or send for Bulletin No. 10

WASHERS, RACES, DISCS AND RINGS

of tool steel, hardened and ground, made to customer's specifications. Our excellent facilities insure high-grade work. *Send Blue-Prints of sizes, today, for quotation.*

Steel, Brass and Bronze Balls



AUBURN BALL BEARING COMPANY

33 Elizabeth Street ROCHESTER, N. Y.

DIES, JIGS AND SPECIAL FIXTURES

DESIGNERS AND BUILDERS OF SPECIAL MACHINERY

FLAT AND ROUND SHANK CUTTERS FOR BRASS WORK OUR SPECIALTY

Send us your Specifications.

MAIL-OM-ETER COMPANY, FACTORY AND GENERAL OFFICES **DETROIT, MICH.**

CHICAGO OFFICE
427 New York Life Building

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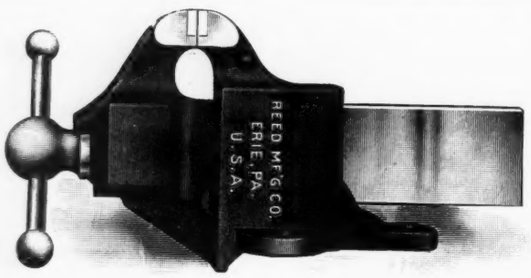
910 Victoria Building

NEW YORK OFFICE
823 Pulitzer Building



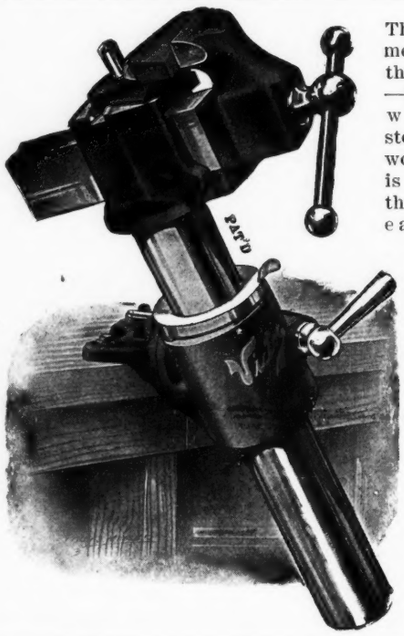
Gripping Power Unsurpassed

Ability to "hang on" is a quality needed in a vise. *Reed Vises* combine this quality with an ability to stand hard knocks. They are guaranteed against breakage except through gross misuse, and are made of the best materials for heavy service — thoroughly strong and durable.

You'll be surprised at the service a Reed Vise gives. Catalogue "H" for the story in detail — yours for the asking.

REED MANUFACTURING COMPANY
ERIE, PA., U. S. A.

The Adjustable Vise



The Victor Vise meets you more than half way—it goes all the way. Don't stoop over your work. If the job is small raise the vise to an easy working level—releasing a single lever does it. If the work goes better at an angle, the Victor gives it.

No chance to slip or jar loose; few parts; strong, long-lived—a necessity to the best work. Send for booklet.

Victor Vise Company
15-19 W. Washington St. SPRINGFIELD, OHIO

Huther Milling Saws
Cut Fast—Have Thin Blades

SHOWING PATENT INSERTED TEETH

Saws with thick blades require more power, they waste material, there is more strain upon them, and they necessarily cut much slower than thin blade saws. Huther Inserted Tooth Milling Saws, 32" in diameter, are 9/32" thick; saws 24" in diameter are only ¼" thick. Made with our High Speed Steel Teeth, they cut steels that no carbon blade will penetrate, and after long service the teeth can be easily replaced. Try one for 30 days—returnable at our expense if not entirely satisfactory. We also make the well-known "Semhi" brand of Milling Saws for cutting metal at slow speeds.

Send for Saw Book.

HUTHER BROTHERS SAW MFG. COMPANY, 1108 University Ave., Rochester, N. Y., U. S. A.

So Easy to Count

The National "Weigh"

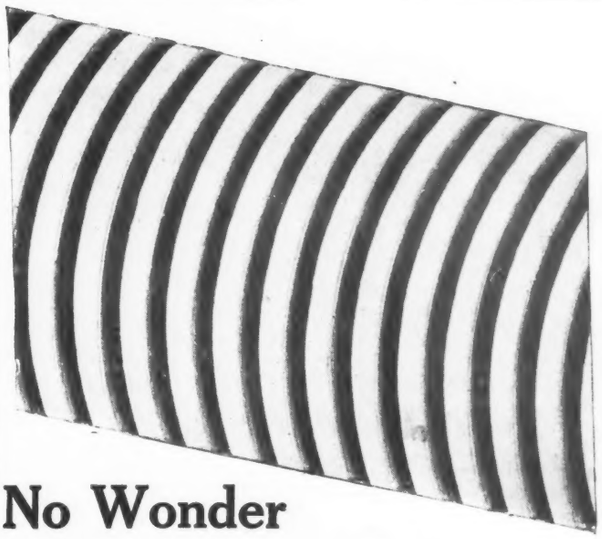
National Counting Machines are sure to bring a smile. This stock boy used to count by hand, but since the advent of the "National" he merely drops the required number of pieces into the ratio pan, sets the tare slide for the weight of the box and — here's where the smile comes in, for it's so easy—balances the answer by sliding the ratio pan to the desired count.

The chance of mistake is eliminated, the time saved a great factor, and the variety of uses to which a National Counting Machine is adapted makes it a valuable asset in any stockroom or factory where counting is done.

"Count the National Weigh."
Ask for booklet when writing.

NATIONAL SCALE COMPANY
Chicopee Falls Massachusetts

COUNTING MACHINE DEPARTMENT



No Wonder VIXEN Files Cut! Look at Those Teeth

The etching above shows how the curved VIXEN teeth look close to the camera. Is it any wonder VIXEN Files rip off tool steel or any other metal in shavings that look like lathe turnings?

VIXEN Curved-Tooth FILES

are guaranteed to cut from 3 to 5 times faster than any other file and to pay for themselves many times over by resharpening.

Every VIXEN Curved Tooth File can be resharpened from 4 to 6 times just like a milling cutter—something possible only with a curved tooth file.

If you are interested in cutting down your file expense, write at once for full details.

Vixen Tool Company
5004 Lancaster Avenue, Philadelphia

Boston **Chicago**

TEAR OUT AND MAIL THIS TO US

Gentlemen:—Without obligation, send me full information.

Name .....

Street Address .....

City ..... State .....

M. 8-13

The "Red Cut Devil" calls for

More Speed In Cutting Operations

There's nothing slow about "Red Cut Superior" Steel. It works up to the highest speeds and finishes a winner every time.

"Red Cut Superior" Steel Cutting Tools add reserve strength and increased energy; they cut through all odds and hold out eight times as long as non-vanadium tools. Get in the "cheering section" at the production race and place your bets on "Red Cut Superior." *Write for schedule.*

VANADIUM-ALLOYS STEEL CO., Latrobe, Pa., U. S. A.

DEPENDABLE FORGINGS

A look through our order books would show you a long list of customers who know where to send for *Dependable Forgings.* These consumers have found

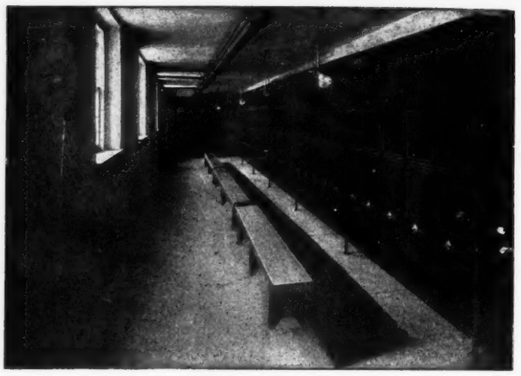
WE HAVE THE EQUIPMENT

and that they can depend upon us to fill all orders *promptly.*

No order is too *large* for us—none too *small.* We can forge anything, and make a specialty of Spindles for engine lathes, drilling machines, etc.

Get our figures—that's all.

The Machinery Forging Co.
CLEVELAND, OHIO



Clean, Safe Storage

Terrell's Steel Bins and Lockers provide a durable, sanitary and thoroughly modern way to store tools, parts, etc.

Steel is replacing wood in all modern shops—it lasts longer, can be taken down and moved when necessary, is more easily cleaned and is recommended by insurance companies. Terrell's Equipment comes in sections—forms one unit and grows as you grow.

Send for catalogue.

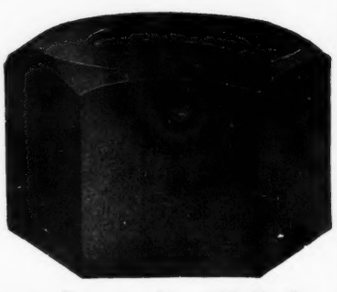
TERRELL'S EQUIPMENT CO.
NORTH GRAND RAPIDS, MICH.

DEPENDABLE FORGINGS

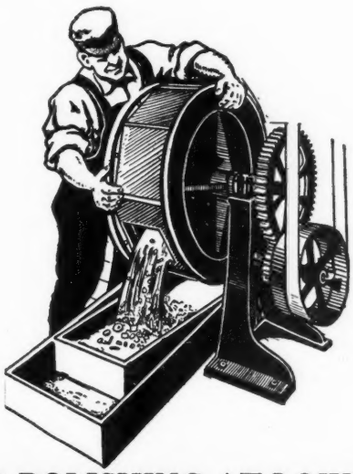
Can you depend on your forgings—are you sure they won't crack under strain—that they can be machined down without too great loss? Dyson Forgings are reliable, durable and find favor among big users.

We make Hex and Square nuts above 2½", Gear Blanks, Spindles, Weldless Rings, Machinery Forging of all kinds, Open Hearth Die Blocks, Shafts up to 4000 pounds weight, etc. Let's talk it over.

Ask for quotations on your specifications.



JOSEPH DYSON & SONS, Cleveland, Ohio



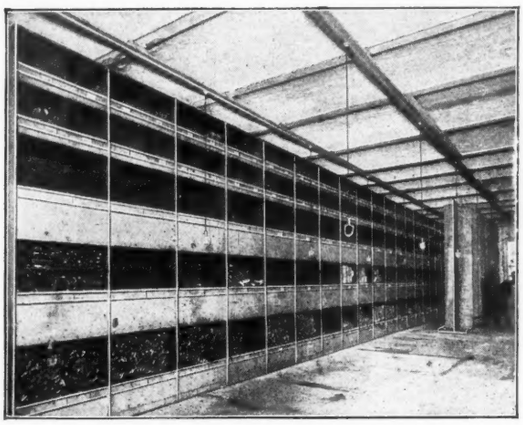
GOOD POLISHING AT LOW COST

Expensive polishing equipment and high-priced labor are entirely done away with when Abbott Burnishing Barrels are used. Abbott Balls do not mar, scratch or remove any material—they polish only. Cost is low. Quality of output is high. And the saving in time will surprise you.

Send us samples of your work. We will polish them—tell you the time it took and what an Abbott installation will cost. Have you our catalogue?

THE ABBOTT BALL CO.
Elmwood, HARTFORD, CONN.

Steel Bins



Berger's Steel Bins and Shelving in Nicholas Power Co., New York.

This view shows one of eleven assemblies.

Each one is 60 feet long, 12 feet high and 20 inches deep.

The result is highest efficiency.

Write for catalog and prices.

THE BERGER MFG. CO., Canton, Ohio

For the best service address nearest branch.

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Also Manufacturers of Tote Boxes and Racks.

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NOW READY

Fourth Edition, Revised and Enlarged

Gebhardt's Steam Power Plant Engineering

By G. F. GEBHARDT, Professor of Mechanical Engineering, Armour Institute of Technology. 8vo. xvi + 989 pages, 605 figures. Cloth. *Net* **$4.00**

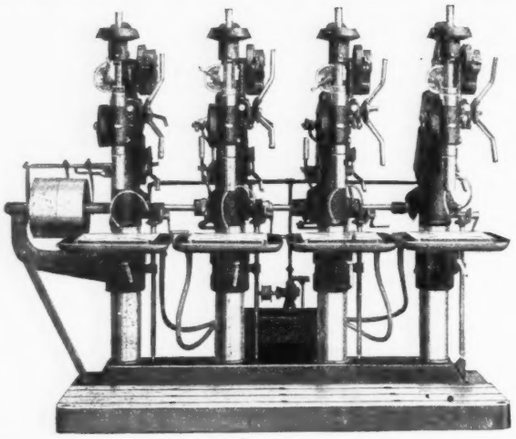
The developments of Steam Power Plants have been so rapid during the past three years that it has become necessary to rewrite the book. Particular attention is called to the chapters on Fuels, Combustion, Engines, Turbines, Condensers, Finance and Economics.

Over three hundred new illustrations have been added, and the entire text has been reset.

With the publication of this edition the price has been reduced from $6.00 net to $4.00 net.

A descriptive circular containing the preface, table of contents and a few specimen pages will be forwarded upon application.

Over 1400% Increase in Production



This 4-spindle 20" all-geared independent column gang drill has enabled a manufacturer to cut his drilling cost from 15½ cents to 1 cent per piece. No wonder he repeated his order.

IT PAYS TO USE OUR ALL GEARED DRILLS.

Eight spindle speeds and eight geared feeds on each spindle, also automatic reverse when wanted. No countershaft; no belts to shift. Built in 20", 24" and 26" sizes.

Tell us about your work and let us help you solve your Drilling and Tapping problems.

BARNES DRILL CO.

Incorporated 1907

814 Chestnut Street Rockford, Ill., U. S. A.

Agents for Germany and Austria: E. Sonnenthal, Jr., Berlin, C. 2. Cologne a Rh. and Vienna. **Great Britain:** C. W. Burton, Griffiths & Co., London, E. C. **Belgium:** G. & F. Limbourg Freres, Brussels. **Ontario:** Kellogg & Co., Toronto. **Japan:** Roku Roku Shoten, Tokio.

"We Want Hogging Machines, something that will punch 1⅜" holes through .50 carbon steel"

—was the gist of an inquiry we had about a month ago, from a well-known concern in Philadelphia.

We are furnishing them two of our 4′ Standard Type, Cone Drive, Heavy Duty, MUELLER Radial Drills. Spindle has ten changes of speed, ranging from 100 to 400 r.p.m. We made a test with a 1⅜" high-speed twist drill, spindle revolving 400 r.p.m. and .019 feed, driving the drill through .50 carbon steel at the rate of 7.60 inches per minute.

If you are in need of something on the same order as this concern in Philadelphia, better take it up with us and see what we have to offer.

Write for literature and prices.

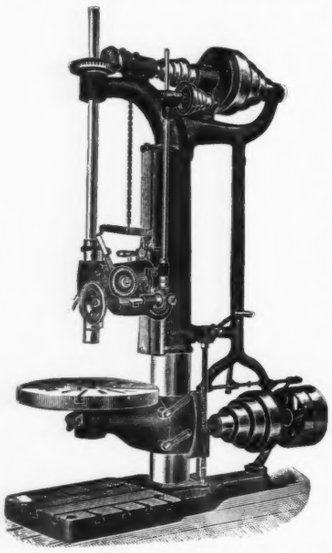
The Mueller Machine Tool Company

RADIALS, DRILLS AND LATHES

CINCINNATI, OHIO, U. S. A.

Do You Work by "Rule of Thumb" Methods?

Is it a matter of guesswork whether jobs come through absolutely accurate or not? If you can't depend on your machine—it's time to make a change.



Mechanics Drilling Machines are accurate, powerful and embody new and time-saving features, among which the eight different feeds, simple tapping attachments and automatic stop are prominent.

The No. 32 "Mechanics" as shown is a type of upright drilling machines which we make in sizes ranging from 14" to 36".

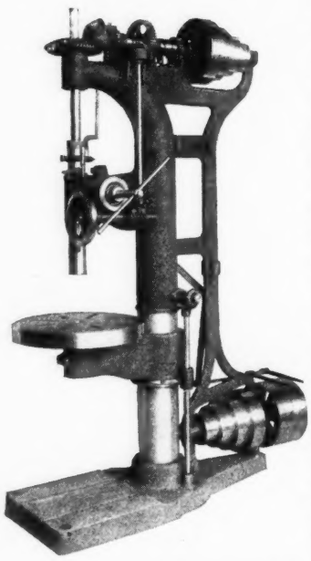
Want to know more about them? Ask for catalogue when you write.

MECHANICS MACHINE CO.

19th Avenue, ROCKFORD, ILL.

SELLING AGENTS: C. W. Burton, Griffiths & Co., London. Ateliers Demoor, Brussels. H. W. Petrie, Toronto and Montreal. P. Nast Machinery Co., Philadelphia. Brown & Zortman Machinery Co., Pittsburgh. Garvin Machine Co., New York. Chas. A. Strelinger Co., Detroit.

THE ECONOMICAL DRILL



SIBLEY stationary head drilling machine. This machine with 24" swing has a guaranteed capacity of 1¼" in soft steel, and will cut drilling costs to a minimum. This style made with 16" to 28" swing.

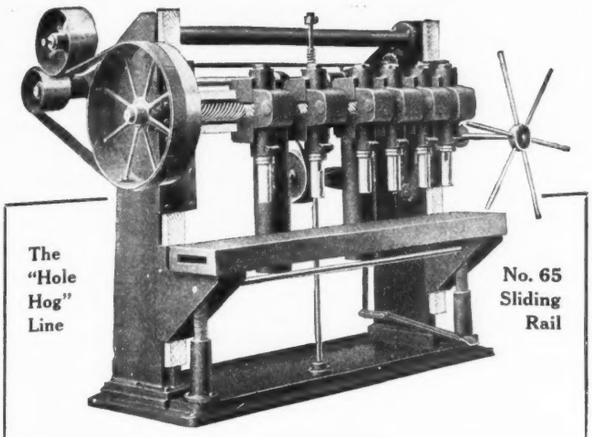
WE MAKE DRILLS ONLY

All machines equipped with ball-bearing spindles, pinions and parts subject to severe strain are of steel. We make a complete line of stationary, sliding and traveling head drills from 16" to 30" swing, inclusive.

Write for catalog. Published in English, Spanish and French.

SIBLEY MACHINE TOOL CO.

8 TUTT STREET SOUTH BEND, IND., U. S. A.



The "Hole Hog" Line

No. 65 Sliding Rail

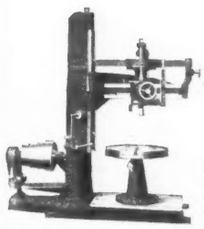
For Work of Extra Length or Weight

which is not readily handled by the table type machine, we have brought out this Sliding Rail Machine. It takes our standard type heads, spiral is belt driven. Rail is counterbalanced and traversed by double steel racks and pinions. Feed is through powerful worm and spiral gearing; automatic stop.

We shall be very glad to answer questions concerning this machine and any other of our manufacture. May we have the opportunity at an early date? We're the snappy, up-to-the-minute kind, to do business with. Write us.

MOLINE TOOL CO., Moline, Ill.

A GOOD RADIAL DRILL MUST RESPOND IMMEDIATELY—OPERATE QUICKLY—BE INSTANTANEOUS IN ACTION—"AS THE EYE IS."



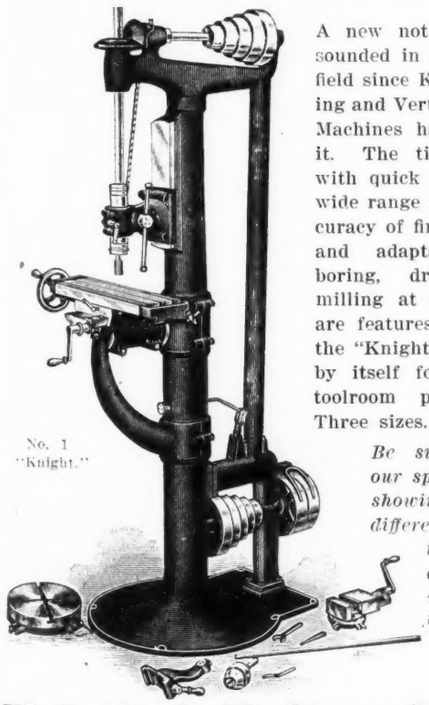
The New Gang Radial Drill Catalogue Ready for Mailing.

THE WM. E. GANG CO.

CINCINNATI, O.

FOREIGN AGENTS: The Canadian Fairbanks Co., Ltd., Dominion of Canada. Sanford & Co., Monterey, Mexico. Limbourg Freres, Brussels, Belgium. Louis Besse, Paris, France.

With the Coming of "Knight"



No. 1 "Knight."

A new note has been sounded in the drilling field since Knight Drilling and Vertical Milling Machines have entered it. The tilting table, with quick adjustment, wide range of feeds, accuracy of finished work and adaptability for boring, drilling and milling at one setting are features that place the "Knight" in a class by itself for all-round toolroom purposes. Three sizes.

Be sure to get our special folder showing sixteen different operations done on this one machine—it's free.

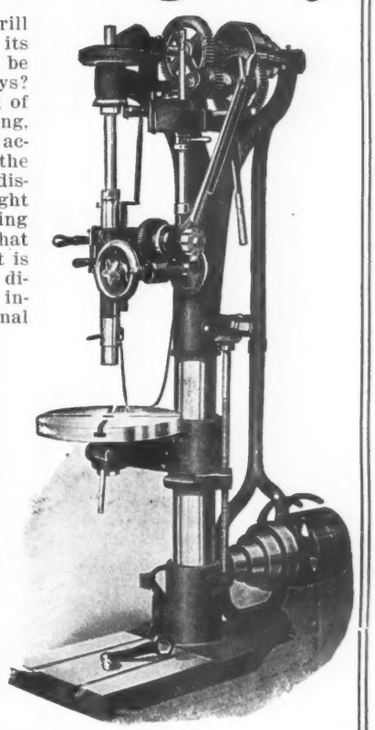
W. B. Knight Machinery Company

2019-25 Lucas Ave. ST. LOUIS, MO.

FOREIGN AGENTS: Schuchardt & Schutte, Berlin, Vienna, Stockholm, St. Petersburg, London, Copenhagen, Prague, Budapest, Shanghai and Tokio.

Aurora Rigidity

Of course the drill you use does its work, but can it be relied upon always? In order to get rid of vibration and spring, and to turn out accurate work all the time, we have distributed the weight in Aurora Drilling Machines so that every working part is braced. A large diameter column insures great torsional resistance, a stiff back prevents springing, and the automatic stop, quick return and geared tapping attachment afford every convenience to the operator, making "Aurora" Drilling Machines an asset in any up-to-date shop.



Catalogue shows the complete "Aurora" line. Shall we mail a copy?

THE AURORA TOOL WORKS

AURORA, IND., U. S. A.

Five Spindle Vertical Nut Tapping Machine

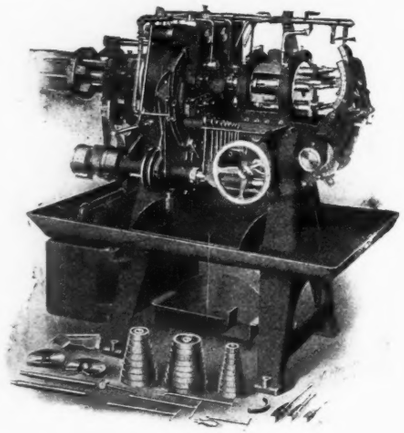
If we simply stated that the capacity of this machine was 20,000 3/8" hot pressed square nuts per day, you would probably be a bit skeptical of our claims, but some of our customers are even exceeding this output on this size nuts—we have prima-facie evidence, and we believe that this is considerably better than any other hand-operated machine is turning out.

Taps are held upright, eliminating chips dropping into nut holders and consequent loss of time in frequently cleaning these out. May we send Catalog "M"?

THE WEBSTER & PERKS TOOL CO.
SPRINGFIELD, OHIO, U. S. A.

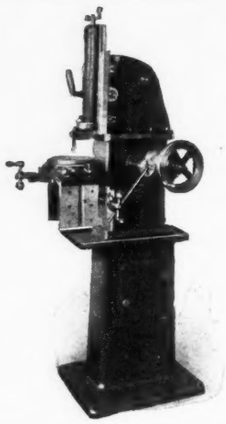
A Matter of Screws

If you are one of the increasing number of manufacturers who takes pride in building up to a high efficiency standpoint, in stopping the leaks and increasing profits, it's time to take up the *Screw* question. Do you make them or buy them? A *Davenport Multiple Spindle Automatic Screw Machine* leaves no doubt about the *best* way. If you don't believe it, ask those who use them.



Complete specifications and details on request. Write now.

DAVENPORT MACHINE TOOL CO.
NEW BEDFORD MASSACHUSETTS
AGENTS: Motch & Merryweather Machinery Co., Cleveland, Cincinnati, Detroit and Pittsburgh. Agents for France: Ph. Bonvillain & E. Ronceray, Rue des Envierges, Paris, France. F. G. Kretschmer & Co., Frankfurt, Germany, and Wien IX/2 Michelbeurnstrasse, 1A. American Machinery Import Office, Zurich, Switzerland.



Seeing Is Believing

With the Rhodes Vertical Shaper the operator can always see what he's doing, for the outline marked on the upper blank of the work is always in sight. No "breaking out" or inaccurate cuts. With a Rhodes "it's up to the operator," for the ram can be placed for any stroke and the head set to any required clearance. Mistakes are few and far between on a Rhodes.

Full details on request.

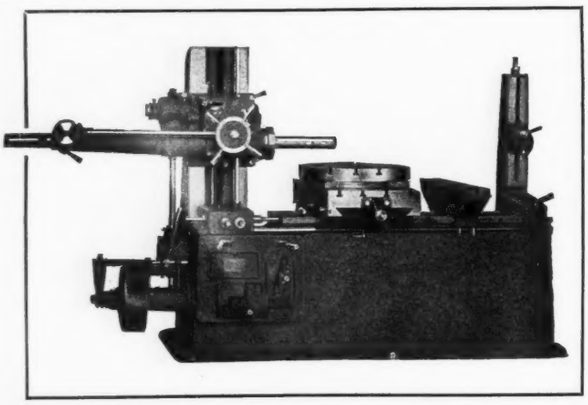
THE RHODES MFG. CO.
HARTFORD CONN.

"FOX" LATHES

STANDARD TOOLS

First Advertised in 1859

THE AMERICAN TOOL & MACHINE CO.
Incorporated 1864 BOSTON



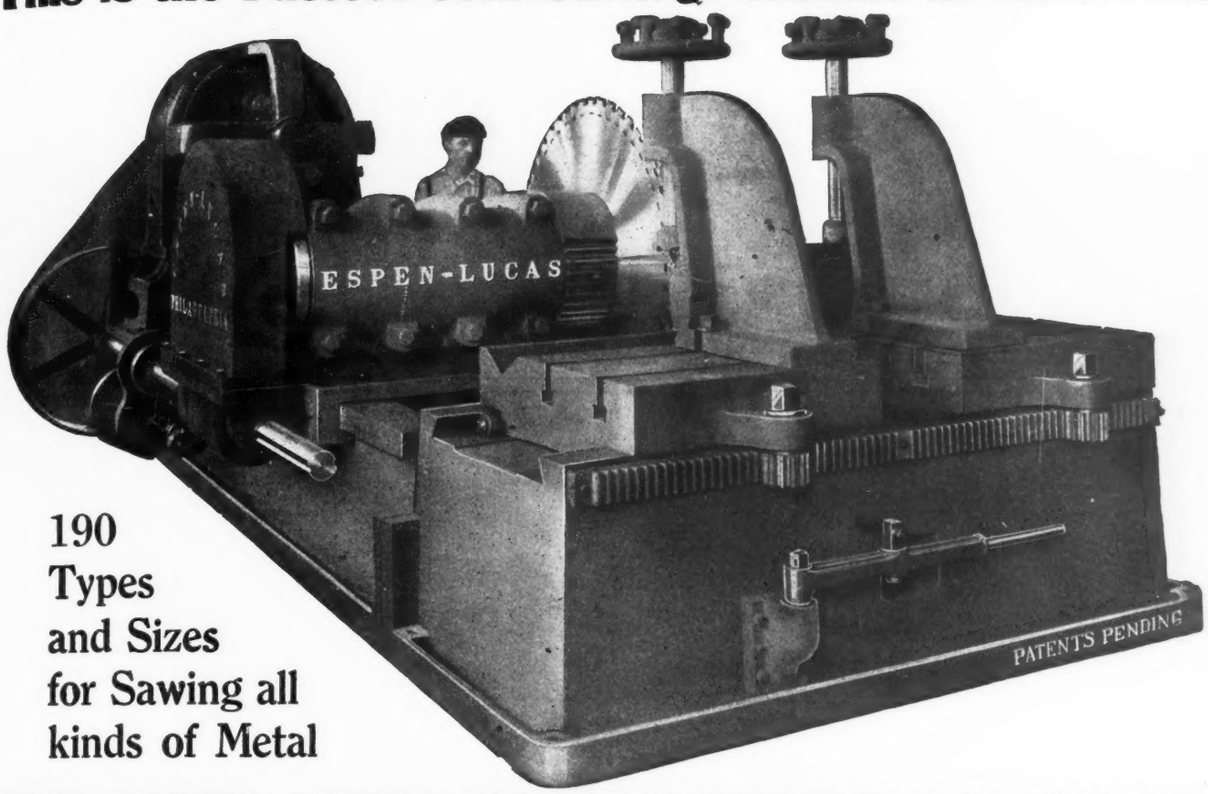
WHY BUY A "CLEVELAND"

Horizontal Boring, Drilling and Milling Machine? Because the Cleveland, by saving time and labor, saves money. Every operating convenience; all speed and feed changes made while machine is in motion; and many other exclusive Cleveland advantages.

Better write about it today—now.

CLEVELAND MACHINE TOOL WORKS
CLEVELAND, OHIO, U. S. A.

This is the Fastest Cold Sawing Machine in the World

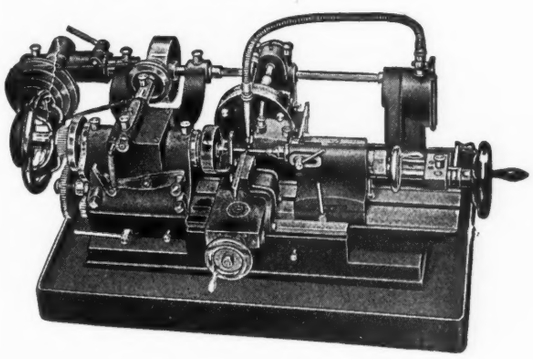


190
Types
and Sizes
for Sawing all
kinds of Metal

THE ESPEN-LUCAS MACHINE WORKS, Front and Girard Avenues PHILADELPHIA, PA.

Consult a "Waltham" on Threading Problems

The Waltham Thread Milling Machine meets every requirement for accurate, fast thread milling. It is especially advantageous for small work. Every improvement has been made with the idea of strengthening the whole machine.

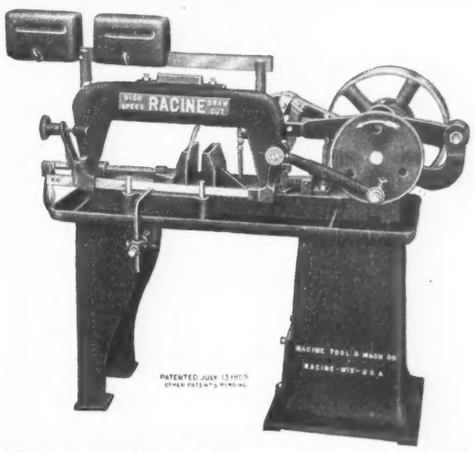


Write for particulars.

WALTHAM MACHINE WORKS

NEWTON STREET, WALTHAM, MASS.

Makers of Precision Bench Lathes and Machinery



THE RACINE TOOL & MACHINE CO.

WILL LET YOU USE A

Racine High Speed Metal Cutting Machine

30 DAYS ON TRIAL

If it does not do as much metal cutting as FIVE to TEN *ordinary* Hack Saws and thereby reduce cutting costs about 500%, you have the privilege of returning the saw at their expense.

One trial order resulted in the sale of over *fifty* Racine High Speed Machines to one steel company. The "Racine" is now built in four sizes, viz., 6" x 6", 8" x 8", 12" x 12", and 12" x 15". Don't continue "hacking" your material, but saw it off with an up-to-date Racine High Speed.

Write at once to

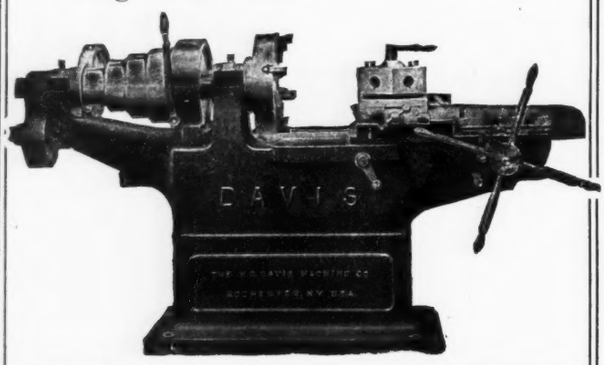
THE RACINE TOOL & MACHINE CO.

RACINE, (Junction Ave.) WIS., U. S. A.

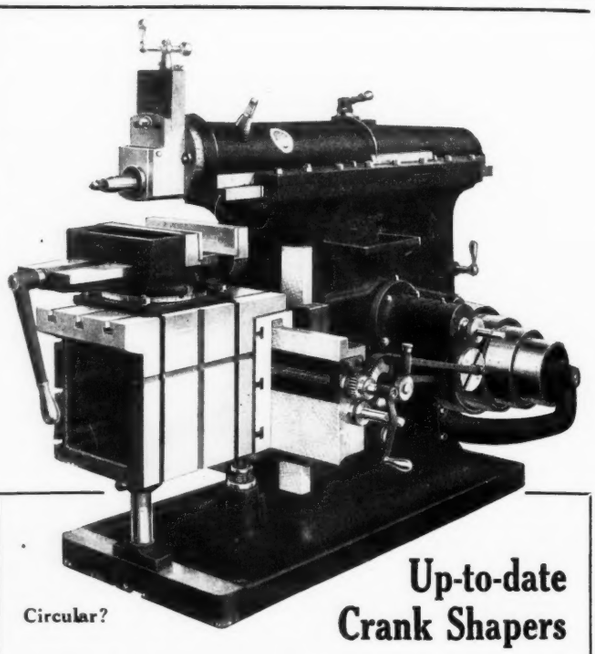
FULL SWING
SIDE CARRIAGE TURRET LATHES
STEINLE TURRET MACHINE COMPANY
MADISON, WISCONSIN, U. S. A.

BUY A "DAVIS"
When You Need a Turret Lathe

Wide range, variety of operations, simplicity of design and tool equipment are "D a v i s" characteristics and "Davis" advantages.
We have a catalogue that's full of facts you ought to know. Costs you the trouble of writing—that's all.



The W. P. Davis Machine Company
305 St. Paul St., ROCHESTER, N. Y., U. S. A.



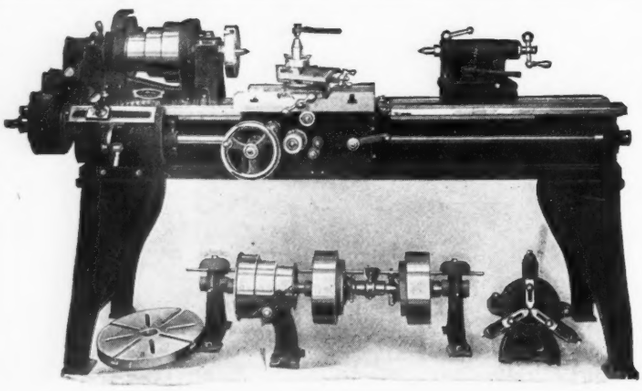
Circular?

Up-to-date Crank Shapers

Rockford Shapers are heavy, powerful machines, built for modern requirements; back-geared, new style rocker arm. Strong, durable, efficient machines that are always "on the job."

Be inquisitive—ask questions.

Rockford Machine Tool Co.
ROCKFORD, ILL., U. S. A.



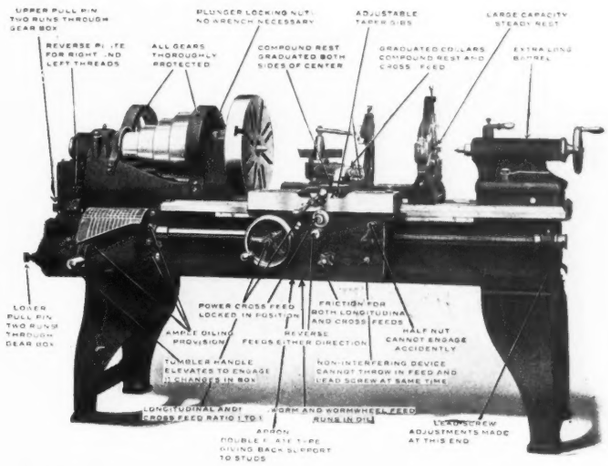
The Best Value
14" Quick Change Gear Lathe

Improved and refined in many details, heavier in headstock construction, and the same quality materials and workmanship that made our former models popular. Actual swing over bed 15¼", 9" Cone Pulley, Back Gear Ratio 9 to 1, 2½" belt on double back geared lathe and 2¼" belt on single back geared model. Compare these figures with other moderate priced tools.

Circulars for complete details.

The Carroll-Jamieson Machine Tool Co.
BATAVIA, OHIO

CISCO 14" LATHES


UPPER PULL PIN TWO RUNS THROUGH GEAR BOX
REVERSE PLATE FOR RIGHT AND LEFT THREADS
ALL GEARS THOROUGHLY PROTECTED
PLUNGER LOCKING NUT NO WRENCH NECESSARY
COMPOUND REST GRADUATED BOTH SIDES OF CENTER
ADJUSTABLE TAPER GIBS
GRADUATED COLLARS COMPOUND REST AND CROSS FEED
LARGE CAPACITY STEADY REST
EXTRA LONG BUSHING
LOWER PULL PIN TWO RUNS THROUGH GEAR BOX
POWER CROSS FEED LOCKED IN FUSS
FRICTION FOR BOTH LONGITUDINAL AND CROSS FEEDS
AMPLE OILING PROVISION
REVERSE FEEDS EITHER DIRECTION
HALF NUT CANNOT ENGAGE ACCIDENTLY
TUMBLER HANDLE ELEVATES TO ENGAGE 11 CHANGES IN BOX
NON-INTERFERING DEVICE CANNOT THROW IN FEED AND LEAD SCREW AT SAME TIME
LONGITUDINAL AND CROSS FEED RATIO 1 TO 1
WORM AND WORMWHEEL FEED RUNS IN OIL
APRON
DOUBLE V RIB TYPE GIVING BACK SUPPORT TO STUDS
LEADSCREW ADJUSTMENTS MADE AT THIS END

16" LATHES CISCO

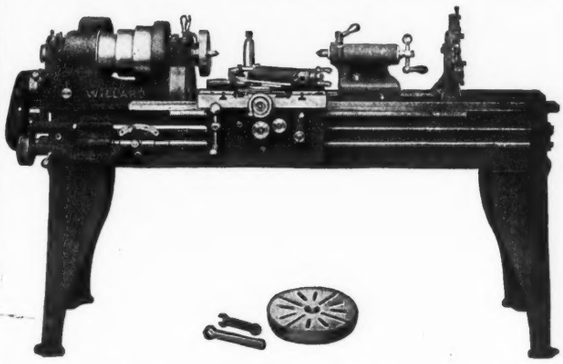
Built Like A Bear For Work

Combine *every essential* of a high priced machine with a *moderate price.* Are designed especially for *shop satisfying* results. Are selling rapidly to buyers who know *a good Lathe.*

HOW ABOUT YOU?

THE CINCINNATI IRON AND STEEL CO.
Makers of 14"—16"—18" Engine Lathes **CINCINNATI, U. S. A.**

Plenty of Power in a Willard Engine Lathe



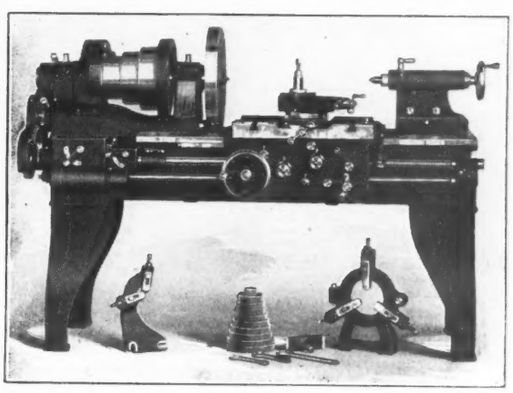
No matter how tough the job, a "Willard" will turn it. Willard 13" Engine Lathes have four feed changes secured by one lever, the gears are quickly meshed for the right speed and a safety device prevents two feeds being thrown in at once.

Willard Lathes take up little floor space, are efficient, convenient, adaptable and accurate to the finest degree. Cabinet Leg model also.

Details?

The Willard Machine & Tool Co.
Cincinnati, Ohio, U. S. A.

A LESSON IN ECONOMICS



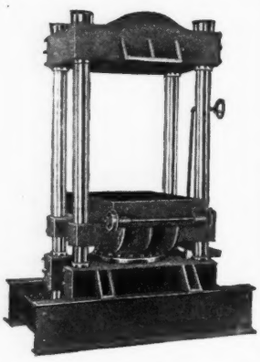
Shop success depends upon management. The elimination of waste; speed in production; accuracy of results—all tell the story of modern efficiency. Rockford "Economy" Lathes are the choice of particular buyers. They have capacity, cut up to ninety-two threads, are back geared and have three quick changes for every change of gear.

When purchasing a lathe consider the speed and flexibility of the Rockford "Economy" Lathe and its many other valuable features.

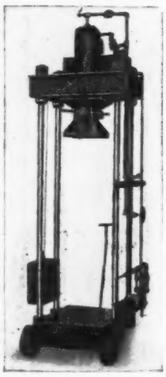
Catalogue?

ROCKFORD LATHE AND DRILL CO.
1827 14th Avenue **ROCKFORD, ILL.**

MOUNT GILEAD HYDRAULIC PRESSES



"For Your Pressing Needs"



Hydraulic Forcing Press

Whatever kind of high power pressing you do—Wheel, Bending, Extracting, Forcing, Straightening, Baling, Powder, Veneer, etc., you are sure to find the press you need in the wide Mount Gilead line. The largest variety of Hydraulic Presses in the world described in our catalogue—also Intensifiers, Accumulators and Hydraulic Pumps.
We solve problems and design presses to meet *peculiar* conditions. If you need presses you need our service.

Write for Complete Catalogue.

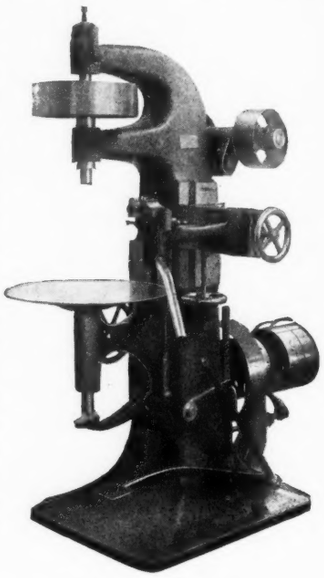
THE HYDRAULIC PRESS MFG. CO.

Eastern Office:
Room 1105-I, 39-41 Cortlandt St., New York City
Chicago Office:
162-166 N. Clinton St.
Home Office:
84 Lincoln Ave., Mount Gilead, Ohio 338

SWAINE SEAMERS

WITH BELT PULL CLOSE TO BASE

This power arrangement assures rigidity and decreases vibration. No wrenches are required in adjusting Swaine Seamers, as clamping levers are provided at all points of adjustment. The hand wheel for lowering or raising the table at will, together with other exceptionally good points embodied in Swaine construction, place this machine at the top from a production and service standpoint.



New catalogue explains in full—ask for it.

FRED. J. SWAINE MFG. COMPANY
7th and O'Fallon Streets ST. LOUIS, MO.
LARGEST PRESS BUILDERS IN THE WEST

THE QUESTION OF THREADING PIPE IS A SERIOUS ONE

You can put considerable money into a pipe machine, but you may not get results.
You can spend a heap of money *buying* your pipe threading, when to do it yourself might *save* you money.
Every manufacturer's pipe threading problems are different. That's why we make several different

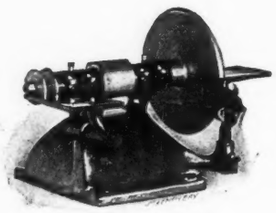
Merrell Pipe Threading and Cutting Machines

One type—the Combined Hand or Power Stationary or Portable Merrell Pipe Threading Machine.

No matter what your pipe threading requirements, there's a Merrell Pipe Machine built to serve you satisfactorily. Simply tell us what you need—and we will prove to you without cost by putting a MERRELL in your shop *on trial*, that it is the right pipe threading machine for you.

THE MERRELL MFG. CO.
15 Curtis Street Toledo, Ohio

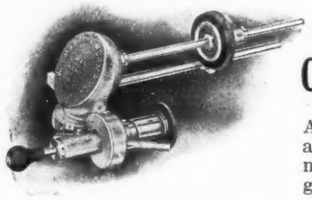
This Disc Grinder



will meet the needs of the tool room and small factory. Has 10" disc, adjustable rests and takes ordinary wheel for tool grinding.

Circular?

BICKFORD MACHINE CO.
GREENFIELD MASS., U. S. A.



Accurate Lathe Centers in 5 Minutes

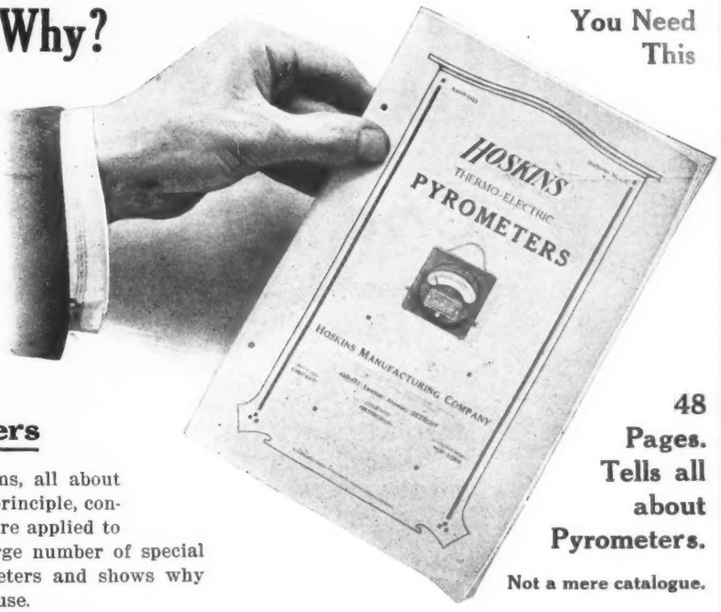
Are your lathe centers always in true alignment? Five minutes' grinding with a *Wilmarth and Morman Center Grinder* will assure perfect centers. Anyone can operate this little tool. You'll be pleased with its good work.
"A Brief Treatise on Lathe Center Grinding" sent on request.

WILMARTH & MORMAN COMPANY
580 Canal Street GRAND RAPIDS, MICH.
MAKERS OF GENERAL GRINDING MACHINERY

What Pyrometer—and Why?

In equipping a modern heat-treating plant, there is no question of whether Pyrometers will be used. The question is—what Pyrometer—and why?

An intelligent answer requires a better knowledge of Pyrometers than the average user has had time or opportunity to acquire. To provide this information, we have prepared a 48 page



You Need This

Treatise on Pyrometers

This booklet tells, in plain non-technical terms, all about thermo-electric Pyrometers. It explains their principle, construction and operation, and shows how they are applied to a wide variety of uses. It also explains a large number of special features to be found only in Hoskins Pyrometers and shows why Hoskins Pyrometers are the best for practical use.

If you are in the market for Pyrometers it will pay you to read this booklet. *Please address "Dept. A" or send in the coupon.*

48 Pages. Tells all about Pyrometers.

Not a mere catalogue.

HOSKINS MANUFACTURING COMPANY

Electric—Furnaces, Pyrometers and Heating Appliances.
"International" Ammeters and Voltmeters.

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We are interested in Pyrometers for.....
You may send us your booklet.

Firm .....
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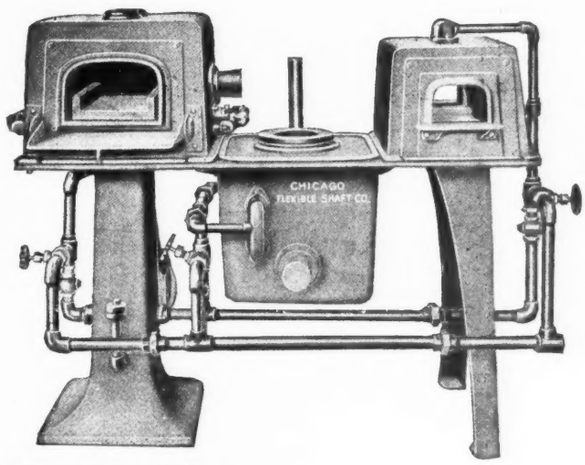
MACHINERY 419



A Heated Argument

for the **Stewart Special Combination Furnace** is found in its economy plus its convenience. This combination is the embodiment of Stewart Quality—the result of years of experience in furnace manufacture.

Muffle Section

Especially adapted for heating materials which must be kept from the fumes of combustion. Compact in form—durable construction—very convenient; by simply removing the Muffle and inserting a slab this section can be converted into an oven for hardening and annealing steel work.

Crucible Section

For lead or cyanide hardening or oil tempering—melting of soft metals, etc.

Forge Section

The general useful furnace of the combination. Especially in cases where direct heat is wanted. The opening in the rear is for the handling of long pieces. By the rotary motion given the flame an even heat is assured, and is under the control of the operator.

Catalogue shows the "Combination" and our full line of Single Furnaces. Shall we mail a copy?

Chicago Flexible Shaft Co., 149 La Salle Avenue, Chicago, Ill., U. S. A.

HORTON-MORROW

The Protected Chuck

A "Horton-Morrow" Chuck is protected. The dirt can't get in, and the mechanism can't get out—nor out of order either. It's self-contained also — you don't have to hunt for a wrench—use your hand. Only occasional lubrication is necessary. The "Horton-Morrow" stays lubricated a long time. The inside of the hood is ground where it bears against the jaws, and the chuck jaws themselves are ground all over.

"Horton-Morrow" Chucks grip — don't slip. They stand the test of hard usage—wear well—last. They are thoroughly satisfactory. Your inquiry would be appreciated and promptly answered.

CONCERNING HORTON SERVICE

A dealer who handles the Horton line has a chuck for every purpose; we'll advise you on any phase of your chuck problems for the asking.

THE E. HORTON & SON COMPANY
WINDSOR LOCKS CONN., U. S. A.

"CUSHMAN"
CHUCKS
AND
FACE PLATE JAWS

Drill Chucks
Lathe Chucks
Centering Chucks
Portable Face Plate Jaws

Iron Bodies Steel Bodies

Many styles and sizes
All designed for hard and exacting Service

Catalog Free

THE CUSHMAN CHUCK CO.
Hartford, Conn., U. S. A.

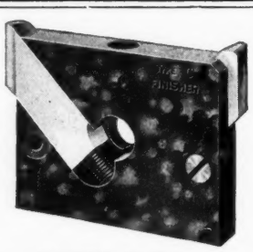
No Key

Our Grönkvist Automatic high speed drill chuck does not require a wrench or stopping of machine in order to change drills. Bear this in mind when you are figuring on how to save time.

Grönkvist Drill Chuck Co.
20 Morris Street JERSEY CITY, N. J.

Agents for Canada: The Stevens Company of Galt, Ltd., Galt, Ont.

HIGH SPEED



Some KELLY "Points"

They last a lifetime, "Save" first piece reamed
Continue to save money

The "big fellows" are doing so NOW

Our B & C Catalogue may start YOU into Modern Methods. Ask for it!

THE KELLY REAMER CO., - - Cleveland, Ohio
London Sidney New York Detroit Boston

FOR YEARS IN THE LEAD

Years of conscientious effort in making chucks that meet all requirements and conditions have made the Sweetland Chuck the Standard. Sweetland Chucks signify workmanship, durability and dependability.

THE SWEETLAND GEARED SCROLL CHUCK

with our patented **Solid** reversible jaws makes two sets of jaws unnecessary. It has stood the test for years and is superseding all others. No other chuck has the **Solid** reversible jaw.

Write today for the Sweetland catalogue; or better still, write us for specific information to Department E. on any chuck problem and we will help you solve it.

Send us a letter to Department E. today.

Hoggson & Pettis Manufacturing Company
NEW HAVEN, CONNECTICUT
103 Chambers Street, New York City

WHAT PEOPLE SAY

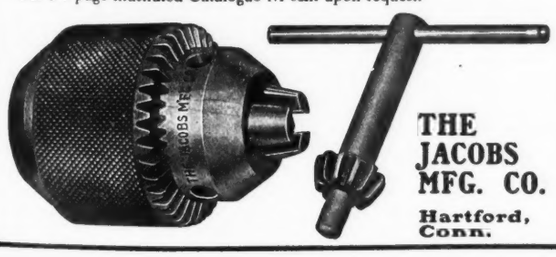
The success of a tool depends on its reception by users. The Metropolitan Electric Mfg. Co. write in part: "We desire to compliment you on the chuck which you recently furnished us. . . . It is certainly a great invention, as it saves a great deal of trouble in changing drills. . . . As our old chucks wear out we expect to replace them with new ones of your manufacture."

Write for details.

WAHLSTROM TOOL CO.
346 CARROLL ST. BROOKLYN, N. Y.

WHY HAVE MORE THAN 150,000 JACOBS IMPROVED DRILL CHUCKS BEEN PURCHASED IN TEN YEARS?

Why were 2620 **Jacobs Improved Drill Chucks** purchased during April, 1913—more than in any other month of our phenomenally successful career?
There can be but one reason, and the answer is—**because** users of Drill Chucks prefer the **Jacobs Improved Drill Chuck.**
Our 34-page illustrated Catalogue M sent upon request.



THE JACOBS MFG. CO.
Hartford, Conn.

The Pratt Chuck Won't Slip

We've made it right—right for its purpose, right for service, right in price—if price is reckoned by efficiency and long life.

The "Pratt" Chuck drives by means of a floating driving dog within the chuck body. The jaws simply hold the drill in the dog—there's no strain on them, therefore no marred drill shanks.

The flattened head of a drill set in this driving dog must turn with the chuck. It can't slip, no matter how great the strain.

If you're using drill chucks let your order read "Pratt."

THE PRATT CHUCK COMPANY
FRANKFORT, N. Y.

EUROPEAN AGENTS: Selson Engineering Co., Ltd., 85 Queen Victoria Street, London, England.

If you want the best Lathe or Drill Chucks—buy Westcott's

Spur Geared Scroll Combination Lathe Chuck.

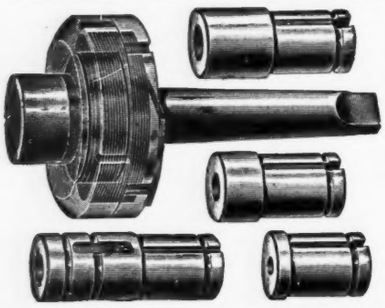
Little Giant Auxiliary Screw Drill Chucks, Little Giant Double Grip Drill Chucks, Little Giant Improved Drill Chucks, Oneida Drill Chucks, Spur Geared Scroll Combination Lathe Chucks, Scroll Combination Lathe Chucks, Geared Combination Lathe Chucks, Geared Universal Lathe Chucks, Spur Geared Scroll Universal Lathe Chucks, IXL Independent Lathe Chucks, Cutting-off Chucks.

Strongest Grip, Greatest Capacity. Great Durability and Accuracy.

WESTCOTT CHUCK CO., Oneida, N. Y., U. S. A.

Ask for catalogue in English, French, Spanish or German.

Little Giant Auxiliary Screw Drill Chuck



The

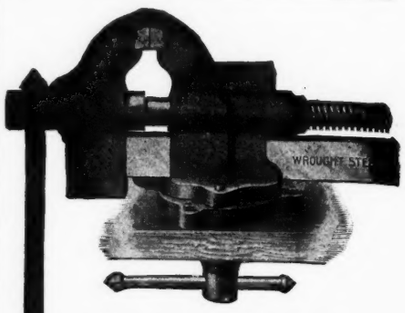
Safety Drill & Tap Holder

is the only attachment for the purpose that gives universal satisfaction. and is

UNEQUALED in Efficiency, Convenience, Rapidity, Accuracy and Simplicity.

Nothing to break or get out of order. Made in 4 sizes, covering from 0 to 2½ in. diameter.

The Beaman & Smith Co., Providence, R. I.



Wrought Steel Bar Combination Base

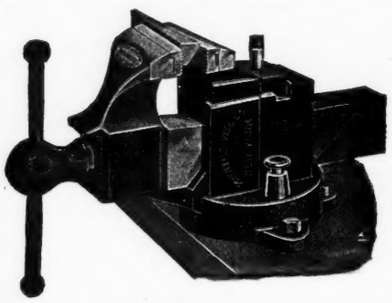
MERRILL BROS., Maspeth, N.Y.

1874 TRUMP DRILL CHUCK 1913

List upon application.

Self centering and well made. Holds either straight or taper shank drills and bits. Readily fitted to any machine. 3 sizes, capacities from 0 to ⅛", ¼" and ⅜".

TRUMP BROS. MACHINE COMPANY, Wilmington, Delaware



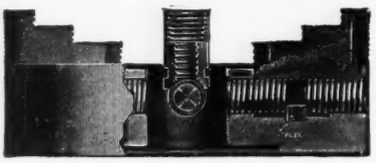
Machinists' Swivel Vise

with self-adjusting jaw that is as strong and durable as any solid jaw, and a Swivel Bottom that gives any desired adjustment to right or left, and is solid and firm at any angle. We make all sorts of good vises, and have been leaders in this line for twenty years. Send for catalogue and price list.

PRENTISS VISE COMPANY

106-110 Lafayette St., NEW YORK

Agents for Great Britain, Chas. Neat & Co., 112 Queen Victoria St., London, E. C.



Solid Steel Rings Reenforce these Independent Lathe Chucks

making them strong where other chucks are weak, providing for tensile stresses and screw thrusts, insuring greater durability and better service.

"National" Skeleton Body Drill Chuck

for highest speeds and heavy work. Made entirely of steel, perfectly balanced, unequaled drive and grip.

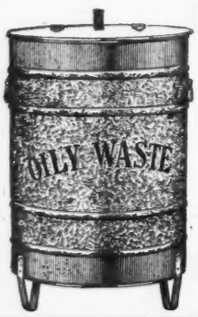
Write for Catalog.

Oneida National Chuck Company, Oneida, N. Y.

Bound Volumes of Machinery

THE INDUSTRIAL PRESS

49-55 Lafayette St. - New York



OILY WASTE

should not be left around the shop—a carelessly thrown match, spark, or fire of any kind—then it's too late to take precautions. Store your waste, oil and other inflammable materials in Delphos Galvanized Cans. Self-closing waste can—Non-overflowing Oil Storage Can and Dispenser—both strong, durable and handy.

Send for circulars.

DELPHOS MFG. CO.

DELPHOS, OHIO

Professional

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C. L. PARKER

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ATTORNEY-AT-LAW AND SOLICITOR OF PATENTS

American and foreign patents secured. Searches made to determine patentability, validity and infringement.

Handbook for inventors sent upon request.

200 McGill Building WASHINGTON, D. C.

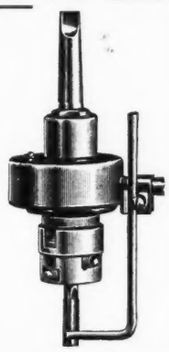
Auto-Reverse **TAPPING CHUCK**

Taps Steel as Safely as Cast Iron

ERRINGTON

41 Cortlandt Street NEW YORK

Style C Adjustable Friction Tap-Holder

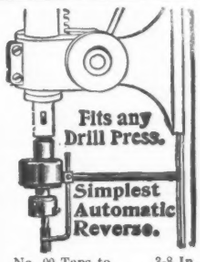


Impossible to Break Taps

"Fool proof"

Graduated Adjustable Friction

Studs and Nut Setters, Screw Drivers, Tap and Die Holders for Turret Lathes, etc.



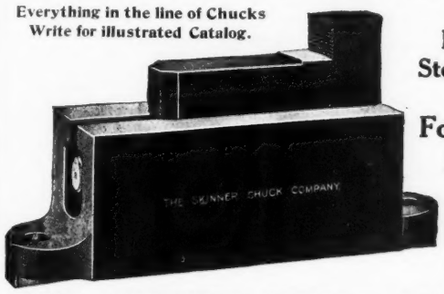
REGULATES THE POWER OF THE MACHINE TO JUST DRIVE, BUT CANNOT BREAK THE TOOL OR INJURE THE WORK.

Deutsche Katalog von Arthur Kayser, Berlin, S. W., Alte Jacobstrasse, 24
Katalog Francais—Edgar Bloxham 12 Rue de Delta, Paris.

No. 00	Taps to	3-8 In.
No. 0	" "	5-8 "
No. 1	" "	3-4 "
No. 2	" "	1 "
No. 3	" "	1 1-4 "
No. 4	" "	1 1-2 "
No. 5	" "	2 "

Skinner Reversible Face Plate Jaws

Everything in the line of Chucks
Write for illustrated Catalog.



Iron or Steel Body

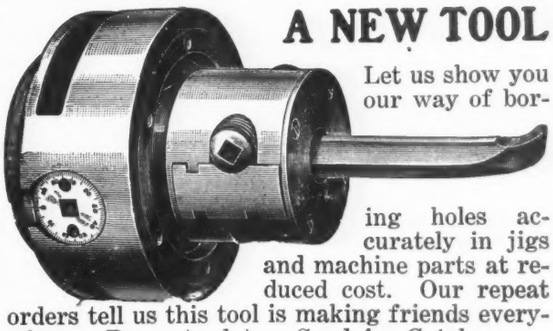
For Large Lathes and Boring Mills

THE SKINNER CHUCK COMPANY

New York Office:
94 Reade St., N. Y.

Factory and Main Office:
New Britain, Conn.

A NEW TOOL



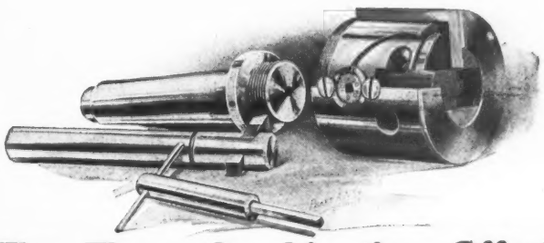
Let us show you our way of boring holes accurately in jigs and machine parts at reduced cost. Our repeat orders tell us this tool is making friends everywhere. Be up to date. *Send for Catalogue.*

MARVIN & CASLER CO., Canastota, N. Y.

T. R. Almond Mfg. Co.

2 Maple Ave.
Ashburnham, Mass.

London Office
8 White St.,
Moorfields,
London, E.C.



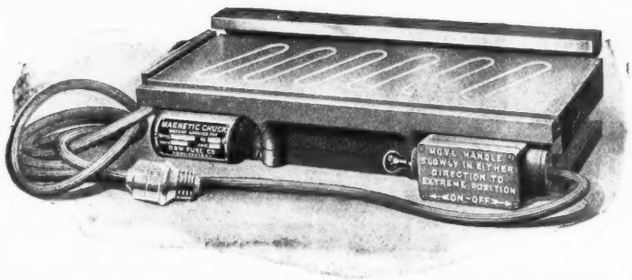
The Flynn Combination Offset Boring Head and Drill Chuck

For use in Horizontal Mills, Vertical Mills, Drill Presses, Turret Lathes and Engine Lathes.

Write for catalogue.

J. T. FLYNN MFG. CO., Detroit, Mich.

WHAT'S THE ATTRACTION?



D & W FUSE COMPANY

PROVIDENCE RHODE ISLAND

The many features found in "D & W" Magnetic Chucks make them especially attractive to men who demand service and durability.

"D & W" Magnetic Chucks

permit the lining up of several chucks for long work; hold many small parts for machining in one operation, and can be used either separately on different machines or collectively as one long chuck, controlled by one switch.

Heat, oil and water proof, with instant release, unusual holding power and many other features make these "D & W" Chucks the "attraction of the season."

Will you write for bulletins?

PRESSED STEEL POTS

for Melting of Metals
Lead Hardening
Cyanide Hardening
Case Hardening

Consistent quality to withstand high protracted heats. Special composition resisting corrosion.

You should have our folder.

THE ECLIPSE FUEL ENGINEERING COMPANY
ROCKFORD, ILLINOIS

DESIGNERS AND BUILDERS OF GAS APPLIANCES FOR HEAT TREATMENT OF STEEL

ROTHMOTORS

GRINDERS POLISHERS

THEIR high, all-day efficiency, low maintenance cost and simple, rugged construction are pre-eminent features. ROTHMOTORS embody all of the requisites of the ideal machine-tool motor, permitting the most efficient operation of each machine. You receive full assurance of motor reliability when you specify ROTHMOTORS. In every sense of the word ROTHMOTORS are good motors.

ROTH BROS. & CO.

1394 W. Adams Street, Chicago, Ill.

Philadelphia, Heed Bldg. Pittsburgh, 1415 Keenan Bldg.
Cincinnati, 126 W. Second St. San Francisco, Monadnock Bldg.

An Everlasting Grind

Doesn't your work wear on your nerves sometimes? You feel as if everything went wrong—jobs come out imperfectly—the men are overworked, and therefore tired—not up to their best. There seems no end of mistakes and errors.

Let "Willey" Electrical Tools do that everlasting grinding—ease up on the strain. They do it well—never get tired—are just as good Saturday night as they were Monday morning—and are paying you, not you them. You may have the most modern shop possible and yet without at least one "Willey" on the job you have not quite reached the summit of perfection.

"Willey" Tools—All ways Correct

Mechanically—Electrically

JAS. CLARK, JR., ELECTRIC CO., Inc.
522 W. Main Street
LOUISVILLE KENTUCKY

BRANCHES:
203 Machinery Hall Chicago, Ill.
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"Willey" Suspended Surface or Internal Grinder

No. 3.

Eck Dynamo and Motor Co.

BELLEVILLE, NEW JERSEY

Specialists in the manufacture of

ELECTRIC MOTORS

for application to all classes of machinery.

1-32 to 20 H. P.

Tell us your needs.

RELIANCE ADJUSTABLE SPEED MOTOR

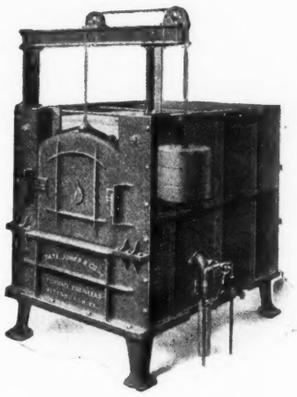
THIS motor runs at any speed and develops a constant output over any range up to 1 to 10. The speed changes are obtained by a simple mechanical method which consists in shifting the motor armature—no electric controller is used.

Our folder 10M tells in detail about the advantages of Reliance Motors and shows interesting applications to machine tools. We shall be glad to send you a copy.

We can also furnish constant speed motors for D. C. or A. C. service.

RELIANCE ELECTRIC & ENGINEERING CO.
1056 IVANHOE RD · CLEVELAND, O.

Tate-Jones Furnaces

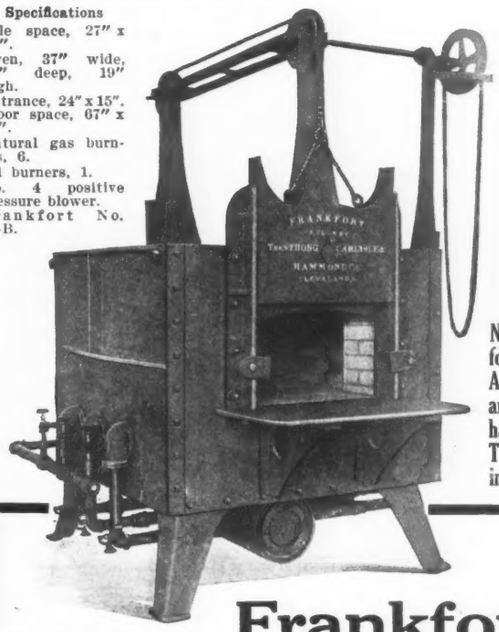


Hardening and annealing steel is an art—the right furnace obviously a great factor toward obtaining best results. The *Tate-Jones Furnace* heats all parts of each box simultaneously; heat may be held to desired temperature constantly and the good service, durability and strength of these furnaces are the best insurance you can have.

Write for details on full line and ask for circular.

Tate-Jones & Company, Inc.
PITTSBURGH, PA.

Specifications
Tile space, 27" x 36".
Oven, 37" wide, 36" deep, 19" high.
Entrance, 24" x 15".
Floor space, 67" x 73".
Natural gas burners, 6.
Oil burners, 1.
No. 4 positive pressure blower.
Frankfort No. 08-B.



No. 08-B for Annealing and Case-hardening. This type in all sizes.

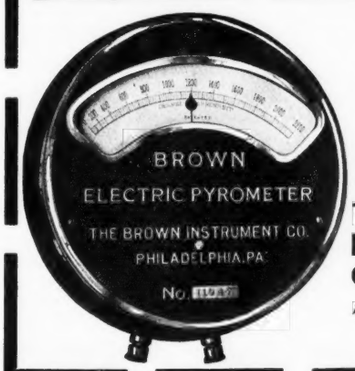
Mr. Superintendent:
Drop us a line today and we will send you by return mail our catalogue showing you, with many illustrations, the famous, complete line of FRANKFORT FURNACES, known for their high quality of construction, their economy of floor space and fuel and their great efficiency in operation. Mention your particular requirements and we will be glad to discuss them with you.

Frankfort Furnaces

Branches: New York, Chicago, Boston, Philadelphia, Pittsburgh, Detroit.

The Strong, Carlisle & Hammond Co.
331 Frankfort Ave. Cleveland, Ohio

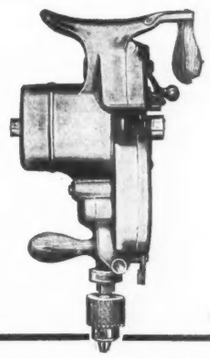
BROWN PYROMETERS



Accurately gauge the temperature of furnaces for heat-treating steel. It is the Standard Pyrometer where accuracy is essential.

THE BROWN INSTRUMENT COMPANY
Est. 1850. **PHILADELPHIA**
BRANCHES: New York, Pittsburg, Chicago.

Drills
Sharpens
Taps
Grinds Valves



"A machine shop in itself"

TEMCO ELECTRIC DRILL

Model B **Portable**

HIGH-SPEED—A high-speed motor, built and thoroughly tested right in our own plant, drives this drill at a speed that means quick, accurate work under all conditions.

LIGHT-WEIGHT—By using a high-speed motor and housing it in an aluminum frame, the weight of Model B is kept down to 11 pounds, making it easy to handle and convenient to carry from job to job.

EASY TO OPERATE—Perfect balance midway between handles, control switch under thumb of right hand, unobstructed view of drill-point, and instantaneous reverse at full speed, enable an unskilled operator to make short work of a hard job with this tool.

DURABLE—Careful inspection and testing of parts, under the severest conditions of actual usage, guarantees its long life.

Ask for a Free Catalogue showing this drill and attachments. State voltage. WRITE TODAY.

The Temco Electric Motor Co.
99 Sugar St. LEIPSIC, OHIO

Kindly send me Temco Electric Drill Catalogue by return mail.

Name .....
Address .....
Business .....
City .....
State .....(99)

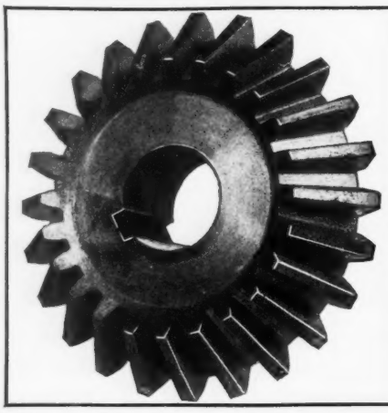
The National Electric Welder Co.

MANUFACTURERS OF

ELECTRIC-SPOT, BUTT and SEAM WELDERS

SPECIAL MACHINES DESIGNED AND CONSTRUCTED

WARREN, OHIO



GEAR SERVICE WORTH WHILE

The satisfaction in ordering "Cincinnati" lies not only in the fact that they are well made, cut right, strong; but in the prompt and efficient attention your order receives the moment it is in our hands.

Bevel, Mitre, Spur, Spiral, Worm, Internal and Rawhide Gears with the "Cincinnati" mark are gears you can bank on. Send specifications for estimate.

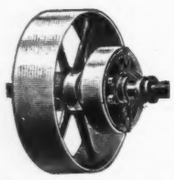
THE CINCINNATI GEAR COMPANY

1827-1833 Reading Road CINCINNATI, OHIO

THE A. & F. BROWN CO.

ENGINEERS, FOUNDERS, MACHINISTS AND MILLWRIGHTS

79 BARCLAY STREET, NEW YORK



Friction Clutch Pulleys and Couplings

POWER TRANSMISSION MACHINERY

FRICTION CLUTCH COUPLINGS FOR HEAVY WORK

GEARS

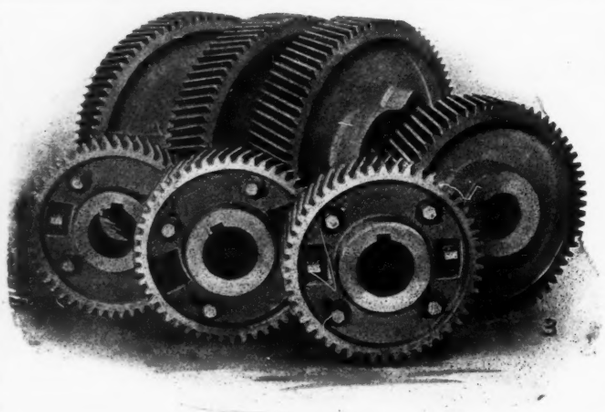
MACHINE MOULDED, CUT SPUR AND PLANED BEVEL GEARS OF EVERY DESCRIPTION

Gears of all kinds and sizes

ROPE DRIVES A SPECIALTY **TURNED STEEL SHAFTING**

WE LAY OUT, MAKE THE DRAWINGS, FURNISH THE MATERIAL AND ERECT IT

SEND FOR CATALOGUE WORKS—ELIZABETHPORT, N. J.



Herringbone Gears

This name should appear on your next gear order because Herringbone gears are capable of being run at high speeds without loss of efficiency, and are in constant contact which eliminates noise, chatter and backlash. We have installed Herringbone gears which are successfully running at 6000 R. P. M.

Want more details?

The Earle Gear & Machine Company

Stenton and Wyoming Avenues PHILADELPHIA, PA.

"V. D. & D."

A GUARANTEE OF SATISFACTION

in connection with

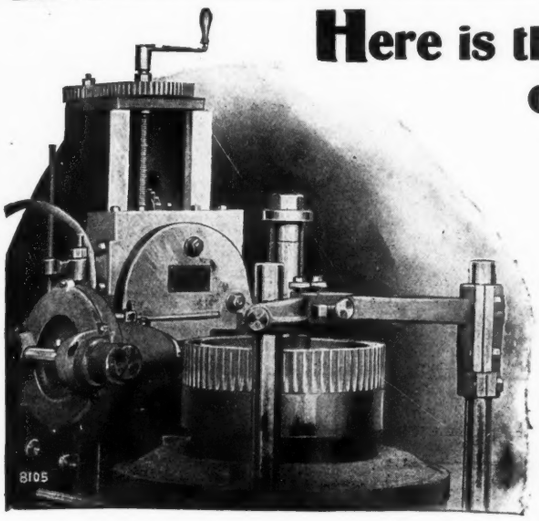
Gears and Gear Cutting

"V. D. & D." Gears and Pinions at all times represent the most careful selection of materials and the highest standard of workmanship produced with unexcelled modern facilities. Our gear production merits your consideration. Send us your specifications.

GEAR DEPARTMENT

THE VAN DORN & DUTTON CO., Cleveland, (Sixth City) Ohio

GEAR SPECIALISTS



Here is the Reason for the Heavy Table on the Farwell Gear Hobber—

We are sometimes asked why Farwell Gear Hobbers are not built on the lines of the old style automatic gear cutter, with a horizontal work arbor instead of the large table and vertical arbor.

The reason is that our hob cuts continuously on three, six, a dozen or even more teeth, depending upon the pitch and the diameter of the gear. This is a heavier cut than is possible on the old style single cutter machine, and some means must be provided to keep the blanks and the arbor from springing.

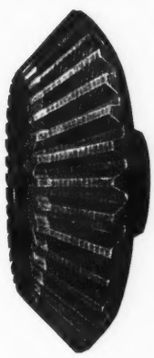
We have found that merely supporting the arbor at both ends does very little good except on small pinions with large bores—the arbor will spring between supports and even solid blanks will chatter if not supported directly under the cut. There is just one way to support the blanks properly and that is at the rim with blocks or a ring resting upon a rigid table.

On Farwell Hobbers the table is the full diameter of the machine's rating; thus the 24" No. 3 Farwell has a 24" table which is supported within a half inch of the outer edge by a circular V bearing.

Get our Circular No. 805-M.

The Adams Company, 928 Market Street Dubuque, Iowa, U. S. A.

"PEERLESS"



No other name fits our Rawhide Pinions as well. We have given the best materials to expert workmen and the result has been "Peerless."

Rawhide Pinions

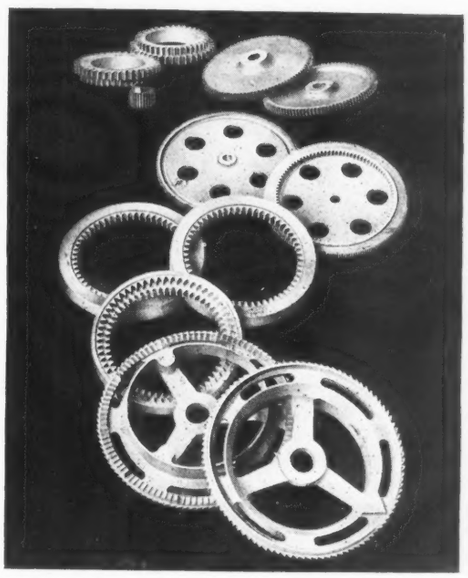
Twenty years of experience in the making of these gears speaks well for our ability to satisfy. We have made every effort to please and have been well rewarded by repeat orders. If you use "Peerless" now, how about some more? If not—start right—order Peerless Rawhide Pinions. We also make cut metal gears.

Better write today for details.

THE HORSBURGH & SCOTT CO.
CLEVELAND, OHIO, U. S. A.

Franklin Die-Cast Gears

Are the Standard for Quality



They embody the three most essential qualities: accuracy, durability and economy. Internal and compound gears are cast as easily and accurately as the more simple types. No stock sizes are carried, but quotation will be made on receipt of samples or blueprints.

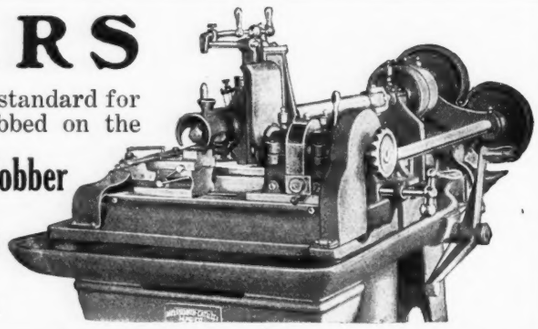
Send for Booklet "C."

Franklin Manufacturing Company
403 South Geddes Street Syracuse, N. Y.

GEARS

that have set a new standard for small work are hobbed on the

No. 3A M-C Gear Hobber



Meisselbach-Catucci Manufacturing Co.
27 Congress St., Newark, N.J.

Grant Gear Works, Inc.

GEO. B. GRANT
6 Portland St., BOSTON, MASS.

Gear Wheels and Gear Cutting

LIST STOCK GEARS

Gear blanks to be changed to your specifications

"Treatise on Gears," by Grant. *Catalogue Free.*

CULLMAN SPROCKETS

IN STOCK AND TO ORDER

Diamond, Whitney, Baldwin and C-T Chains on hand.

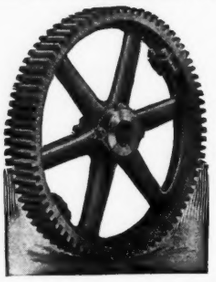
New Catalog.

CULLMAN WHEEL CO., Chicago
1339 Greenwood Terrace

POOLE GEARS

Machine Molded or Cut

Spur
Bevel
and
Angle
Gears



Mortise
Internal
and
Worm
Gears

Our facilities range from the smallest to a gear fifty feet in diameter.

BUILDERS OF
HEAVY MACHINERY

Poole Engineering & Machine Co.
BALTIMORE - - MARYLAND

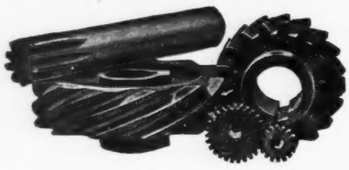
BEVEL GEAR GENERATORS

BEVEL GEARS

CUT THEORETICALLY CORRECT

Special facilities for cutting Worm, Spiral, Mitre, Internal and Elliptical Gear Wheels.

THE BILGRAM MACHINE WORKS, 1231 SPRING GARDEN ST PHILADELPHIA, PA.



Gears and Gear Cutting

We Guarantee Satisfaction

RODNEY DAVIS, Philadelphia

If You Use Gears

you'll find complete satisfaction in specifying "Union" Spur, Spiral, Bevel, Internal and Worm Wheels of any pitch. Eighteen years of experience qualify us to handle your gear orders with dispatch and to your entire satisfaction.

Estimates on request.

UNION GEAR & MACHINE CO.
85 Purchase Street, BOSTON, MASS.

Gears

CUT GEARS OF ALL KINDS
Spur, Bevel, Spiral
Worms and Worm Wheels, Sprockets
New England Gear Works, 100 Purchase St. BOSTON, MASS.

NOT IN A TRUST

HAYES FILE COMPANY, Detroit, Michigan

Use our SPECIAL SOLDER-CUT File, for filing Solder.

SHAPERS

EXCLUSIVELY

12 TO 32 INCH STROKE.

Smith & Mills Co.
Cincinnati, Ohio, U. S. A.

FOREIGN AGENTS: C. W. Burton, Griffiths & Co., London. G. & F. Limbourg Freres, Brussels. Van Rietschoten & Houwens, Rotterdam. Glaenzer, Perreaud & Thomine, Paris. Stussi & Zweifel, Milan.

The Famous McCullough-Dalzell Crucibles prove themselves a true economy, saving money every working hour—for you. We like to convince the skeptical. Send us your next order.

McCULLOUGH-DALZELL CRUCIBLE CO. **Pittsburgh, Pa.**

GEARISMS

Published by the Philadelphia Gear Works
1120 Vine Street, Philadelphia, Pa.

Vol. 1 AUGUST 1913 No. 11

DEVOTED *to the* INTERESTS *of* GEAR USERS EVERYWHERE

Edited by the Little Gear Man

Making hay while the sun shines *is* a hot job—but there's an even hotter one—trying to make repairs on a machine *without* the necessary repair parts, but *with* the "man who pays the bills" asking every hour or two, "When 'll that machine be running again?" Ever been up against that proposition?

Hay can't be made unless the sun does shine; but you don't have to wait for a break to occur before you order *duplicate gears*. All gears wear out in time, so there's no loss in buying duplicates, and they do sometimes break without warning. That is the time an extra gear in the storage bin is worth a hundred "on order."

"Matchless" Rawhide Pinions are thoroughly satisfactory noise eliminators—fully up to Philadelphia standards. Try them. Catalogue and other interesting gear advertising, folders and bulletins on request.

Rawhide Pinions Should be Reinforced

when they replace steel pinions under severe working conditions. A bolted through bronze reinforcement, such as used in Philadelphia "Matchless" Pinions, is excellent construction, combining great strength and wearing qualities with noiseless operation. High-speed cast-iron pinions may be replaced by rawhide pinions of the same dimensions. The bronze rawhide construction, however, adds durability in every service.

A standard German handbook (Hutte) gives the following rule for finding the allowable load in pounds at the pitch line, for rawhide pinions: Multiply the width of face in inches by from 180 to 360, and divide the product by the diametral pitch. However, in this country makers use a factor as high as 450 with satisfactory results. This rule makes the strength independent of the velocity of the pitch line, which is logical, since the decrease of strength with increase of velocity is due to impact, a source of trouble which is seldom met with in rawhide gearing.

LARGE GEARS

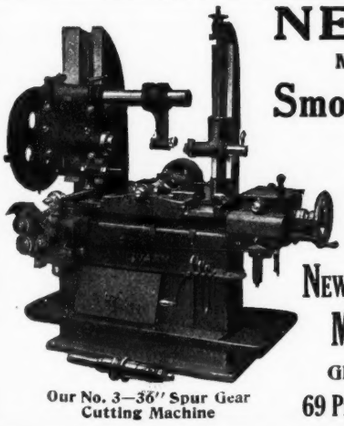
FOR

Sugar Mills—Brass Mills
Presses—Rolling Mills
Bridges

Cast Iron,
Cast Steel, Bronze

Cut or Machine Molded

TAYLOR-WILSON MFG. CO.
1000 Thomson Avenue
McKees Rocks, Pa.



NEWARK
MACHINES FOR
Smooth Running Gears

Write for Catalog

Our No. 3—36" Spur Gear Cutting Machine

NEWARK GEAR CUTTING MACHINE COMPANY
GEAR SPECIALISTS
69 Prospect St., Newark, N. J.

Machine Cut Bevel Gears

that will meet your exacting requirements can be cut from our vast stock of patterns, or specially made according to your specifications.

The most modern machines and the best material obtainable are used by us in the extensive production of cut bevel gears of every description.

Let us know your requirements.

Nuttall - Pittsburgh

METAL

You Can't Put Your Gear Work into Better Hands

This is for seven good reasons:

1. Twenty-five years of making gears exclusively gives us the "know-how."
2. Our plant is the world's largest, devoted exclusively to gear-cutting.
3. Our equipment includes every desirable tool for quantity production, for precision and for uniformity of machining.
4. First class work is further assured by the continued use of thousands of our gears annually, as standard on leading makes of machine tools and automobiles.
5. Prompt delivery is assured by our large capacity (Bevel gears alone, 3500 per day) and by our large stock of metal and patterns.
6. Attractive prices because every job goes onto the most economical machine and is handled by men long experienced in that particular line.
7. Complete or partial service as desired, including pattern work, furnishing brass, bronze, iron or steel castings, forgings of bar stock, blanks, cutting, carbonizing, hardening or finishing complete.

Try us on any size and type of spur, bevel, internal or worm gears.

N.P.R.H. REG. U.S. PAT. OFF.

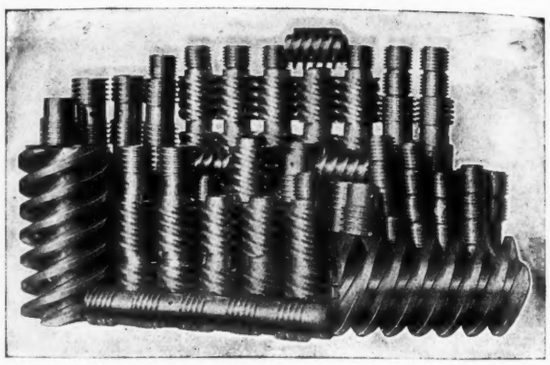
YOU CAN'T PUT YOUR GEAR WORK INTO BETTER HANDS

NEW PROCESS GEAR CORPORATION

SYRACUSE, N. Y.

60

GEARS



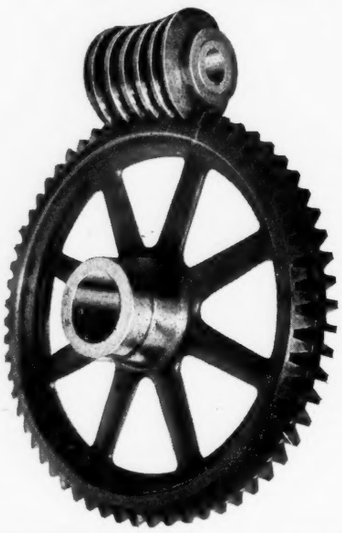
Heavy Truck Gears

are one of the specialties which our new plant—the largest gear factory in the West—is prepared to furnish on short notice. Rush orders on Rawhide, Iron, Steel and Cut Gears receive prompt attention, and we pride ourselves on our ability to make special gears for special uses.

Write for "Gear Problems F. X."

FOOTE BROS. GEAR & MACHINE CO.

210-220 N. Carpenter Street CHICAGO, ILL., U. S. A.



HINDLEY GEARS

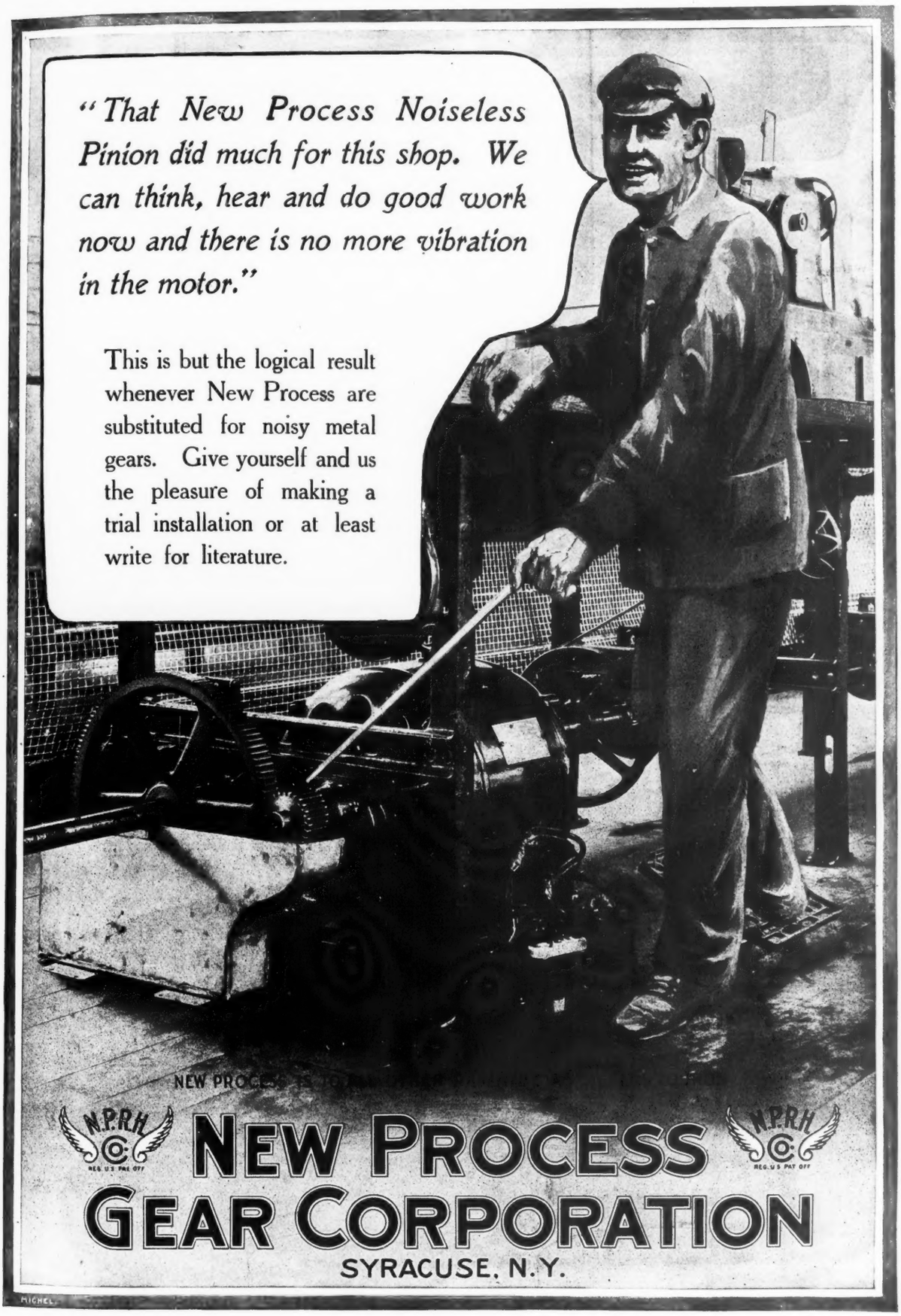
SAFE, SILENT AND EFFICIENT

Forward us your Gear proposition

Hindley Gear Company

1105 Frankford Ave., Philadelphia, Pa.

(Formerly Hindley Gear Dept.—Otis Elevator Co.)


"That New Process Noiseless Pinion did much for this shop. We can think, hear and do good work now and there is no more vibration in the motor."
This is but the logical result whenever New Process are substituted for noisy metal gears. Give yourself and us the pleasure of making a trial installation or at least write for literature.
N.P.R.H.
NEW PROCESS GEAR CORPORATION
SYRACUSE, N.Y.

1314 A

Your Gisholt Reamer Catalog is Ready for You

SEND FOR IT

This Book is **More than a Price List.** It is a **Handbook of Information,**

of value to every machinist, foreman and shop superintendent.

It deals with the approved methods of **honing and grinding reamer blades, clearances, etc., reaming allowances in various materials, correct shop practice in the use of reamers, their adjustment and care.**

Experienced shop men will welcome the broad practical suggestions which accompany the description of various types of **Gisholt solid adjustable reamers.**

GISHOLT MACHINE CO.
Small Tools Dept. Madison, Wis.

GISHOLT

DIE-CASTINGS

Are Better Than Machined Products

If—Free from Flaws,
True to Specifications,
Cast of Dependable Alloys.

Years of experience have taught us how to meet these conditions.

Quantity of production permits the substitution of

VAN WAGNER

die-cast parts for machined parts at a saving.

Send Blue-Prints, Samples or Specifications for our estimates.
Prompt Quotations will follow.

E. B. Van Wagner Mfg. Company
SYRACUSE, NEW YORK

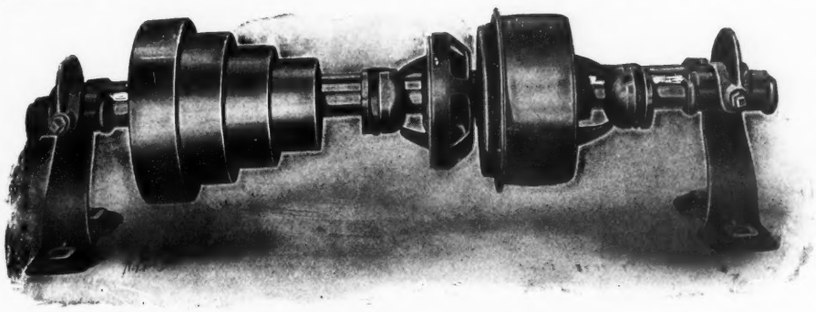
A New Steel Tool Rack

One of the handiest pieces of steel furniture in the shop is the New Britain Steel Tool Rack. Three spacious steel trays, adjustable to height, construction which affords rigidity, and their portability, are features which will be appreciated by shop men everywhere.

Ask for catalogue of "New Britain" Steel and Iron Shop Furniture.

THE NEW BRITAIN MACHINE CO.
64 BIGELOW ST., NEW BRITAIN, CONN.

SMITH'S ONE-BELT REVERSING COUNTERSHAFT



Our One-Belt Reversing Countershaft drives machines forward and reverse, using one belt only—saves belts, saves power, acts quicker than any two-belt countershaft, wears longer and costs about the same—sometimes actually less.

Get the descriptive circular.

PATTERSON, GOTTFRIED & HUNTER, Ltd., 211 Centre St., New York City

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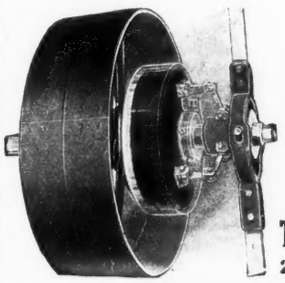
"We guarantee our Friction Clutches to be first class in every particular, to transmit the full power for which they are listed, and to operate satisfactorily. We will replace or refund the money paid for any Edgemont clutch which does not come up to our representations." Edgemont Clutches are virtually self-contained, easily adjusted, adaptable, serviceable, durable. Try one. Ask for folder.



The Edgemont Machine Co.
2700 National Ave., Dayton, O.

LET'S PULL TOGETHER

Our purpose is to please; to do it we've got to deliver the goods, and the answer is the Peerless Hoist. Noiseless and safe, it automatically holds any load from 500 to 40,000 pounds and does its work, day in and day out, with perfect satisfaction. All parts are interchangeable. Let's pull together on this matter—it will lift a load of care from your shoulders. Catalogue?

EDWIN HARRINGTON, SON & CO., Inc.
PHILADELPHIA, PA.

Fawcus Machine Company
PITTSBURG, PA.

Gears of all descriptions to 24 feet diameter.
Heavy machinery designed and furnished for all purposes.

Works: Ford City and Pittsburg, Pa.

Main Office: Pittsburg, Pa.
New York Office: 50 Church Street

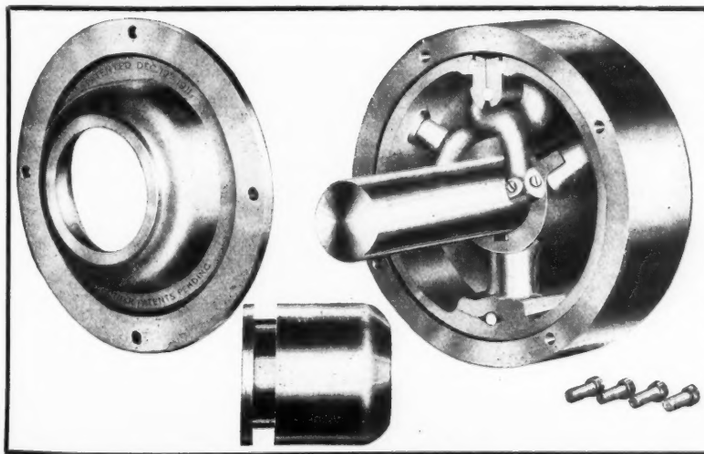
Oxy-Acetylene Welding and Cutting Apparatus

OXY-ACETYLENE WELDING DAVIS APPARATUS DAVIS-BOURNONVILLE CO. N.Y.

Highest efficiency in results and greatest economy in operation. High pressure, positive mixture torches. Complete outfits for greatest requirements.

Write for new catalog No. 97.
Full information, illustrations, etc., on request.

DAVIS-BOURNONVILLE CO., 30 Church Street, New York



The Cleveland Clutch—Simple and Strong

Few parts, no spring or delicate mechanism to get out of order or break. Every part of a "Cleveland" Clutch is made strong enough to bear more use and abuse than it will ever ordinarily receive.

A "Cleveland Clutch" grips hard, but will slip on overload, saving both machine and clutch from injury. May we have a little chat with you on Clutch Problems?

THE CLEVELAND CLUTCH CO.
224 Prospect St., Ravenna, Ohio
We also make the HALE Loose Pulley

ONE MAN HANDLES THIS LOAD

LIFTS, TRANSFERS AND PLACES IT WITH A

CURTIS AIR HOIST

ON CURTIS TROLLEYS

If you have hoisting or other straight line power motion, whether push, pull or both, no matter how steady or jerkless the movement required or whether constant or variable load, a Curtis Air Cylinder will efficiently handle it.

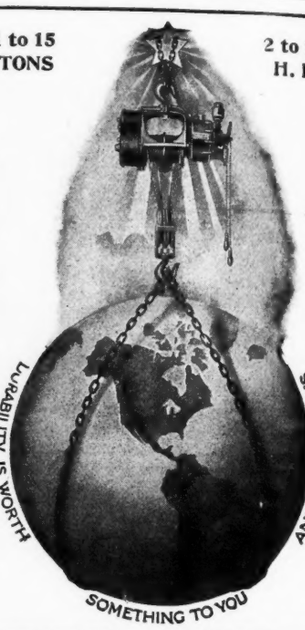
How about an adoption of this equipment for your plant?

CURTIS PNEUMATIC MACHINERY COMPANY, 1568 Kienlen Ave., St. Louis, Mo.

(Operated by Curtis & Co. Mfg. Co.)

1 to 15 TONS

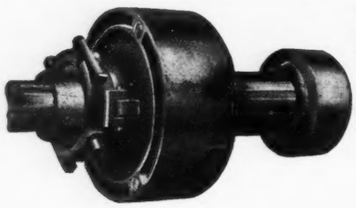
2 to 20 H. P.



DETROIT HOIST AND MACHINE CO.

DETROIT, MICH.

Saves Your Oil



Our E. G. I. Friction Clutches need lubrication but once a month. They're made Ring Oiling — every revolution delivers lubricant to the bearing without waste. They're especially desirable for direct line shaft driving, but can be used for any service. Shipped on trial. *Send for circular.*

ENGINEERING CO
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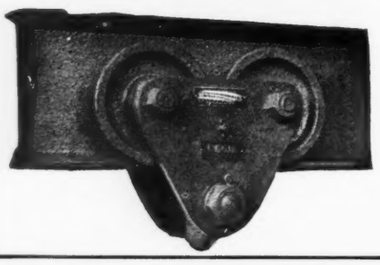
READING, PA.
133-135 N. 3rd Street

HOISTS New Patent Whip
Patent Friction Pulleys
NONE BETTER
MANUFACTURED BY
VOLNEY W. MASON & CO., Providence, R. I., U.S.A.

TROLLEYS



MARIS BROS.

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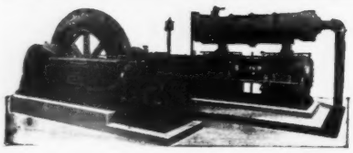
PA.



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with your present Handle costs our Prices for Ball Cranks and Machine Handles of every description, from bar steel. Accurate, highly finished, complete in every detail and ready to attach.

The Cincinnati Ball Crank Co.

Cincinnati, Ohio.

Successors to this dept. of the SCHACHT MFG. CO.

Ask us for Our Guarantee as to Economy

Bury Three-cylinder Compound Variable Volume Air Compressor making new world's record. *Patented.*

BURY COMPRESSOR COMPANY

ERIE, PA., U. S. A.

Established 1902

MOBERG

DIE CASTINGS

We do not claim to be the only die casting concern in the country, but have customers who say we are.

C. J. MOBERG, Inc.

Beach Street, Mount Vernon, N. Y.

INDESTRUCTIBLE HANDLES

How often one picks up a file and finds the handle cracked or broken. It is impossible to put much pressure on a split handle without piercing the hand with the file shank. Put Osgood's "Indestructible Handles" on all your small tools—they last longer, fit better, positively will not split, and give complete satisfaction.

Send four cents for sample.

J. L. OSGOOD TOOL COMPANY, 121 Erie Co. Bank Bldg., BUFFALO, N.Y.

SECTIONAL BLUE PRINT

FILING CABINET

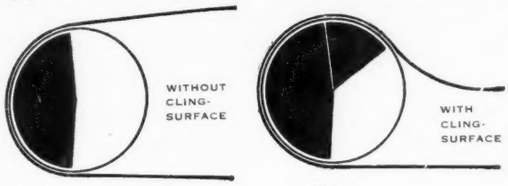
You can buy one section or ten and add to them as your business demands. Perfectly made of best oak. These cabinets can be used for a variety of purposes, and should be in every office. We also make all kinds of draughting-room furniture and our prices are right. *Send at once for our descriptive matter and prices.*

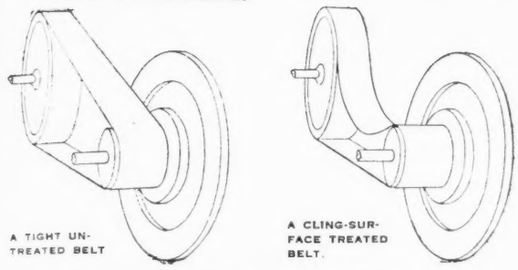
FRITZ MANUFACTURING COMPANY

60 Alabama Street GRAND RAPIDS, MICH.

THIS TIGHT 170° ARC UNTREATED

OR THIS ? OR SLACK ? OR 225° ARC? OR TREATED?





The above diagrams, made directly from actual installation, speak volumes for Cling-Surface. Increased arc, higher pulling capacity for the belt, non-slip, decreased power loss, longer belt life, water-proofing, saving in lubricating oil, and many other points.

Send a trial order, or, at least, send for further proof.

CLING-SURFACE CO

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New York Chicago Denver Boston
Memphis St Louis Atlanta
Toronto Etc

London—Thomas & Bishop 119-125 Finsbury Pavement E C

Paris—74 Rue des Ecluses St Martin

Dusseldorf—Stromstrasse 1

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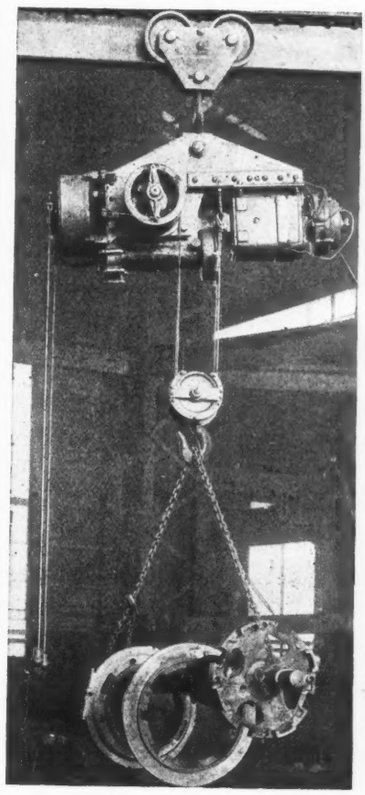


This Brownhoist Electric Hoist

has a rating of 1200 ft.-tons per hour, which means that it will lift 4 tons, 10 ft. every 2 minutes, continuously for months.

All of our hoists are built for just such a service.

And you get just such a rating and guarantee when you buy any Brownhoist Electric Hoist.

Let us prove to you what it will do.

Write for Catalog "D" on electric hoists.

THE BROWN HOISTING MACHINERY CO., Cleveland, Ohio

New York Pittsburgh Chicago San Francisco

You'll Find It "Worth" Many Times Its Cost"

WHY does the Lagonda Mfg. Co., Springfield, O., say, "We would not be without it for many times its cost"?

BECAUSE

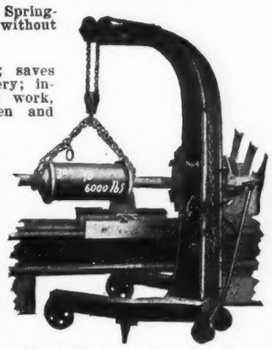
It saves their men on heavy lifts; saves them time, money, labor and drudgery; increases their facilities for handling work, and insures absolute safety to men and machines.

IT WILL DO THIS FOR YOU

Really, you must use the tool to thoroughly appreciate what it means to you in your shop.

Write today for booklet E-10; we'll tell you how and why you're losing money without it.

Don't delay; it's costing you too much.

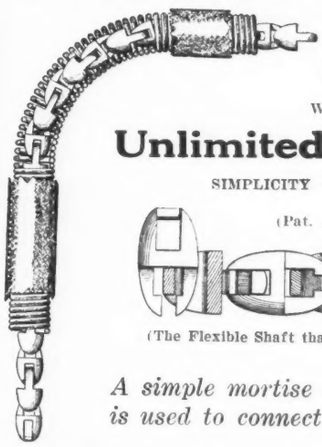


"Handiest Tool in the Shop" Portable Crane and Hoist.

THE CANTON FOUNDRY AND MACHINE COMPANY

Canton, Ohio, U. S. A.

NO MORE FLEXIBLE SHAFT TROUBLE



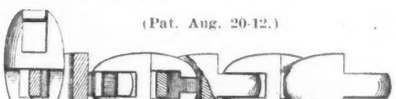
A Unit Flexible Shaft that is a Flexible Shaft

WITH

Unlimited Flexibility

SIMPLICITY IS DURABILITY

(Pat. Aug. 20-12.)



(The Flexible Shaft that is Simplicity in Itself.)

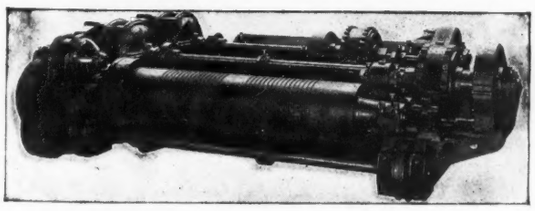
A simple mortise and tenon interlock is used to connect the units together.

No rivets, pins, retainer rings or brazed end sleeves to cause trouble.

Plank Flexible Shaft Machine Company

Grand Rapids, Michigan

"TOLEDO CRANES"



Cranes, Hoists, Grab Bucket Machinery, Coal and Ore Handling Bridges, also Structural Steel for Factory Buildings.

THE TOLEDO BRIDGE & CRANE CO., Toledo, Ohio

The Hand Chain cannot "gag" when the

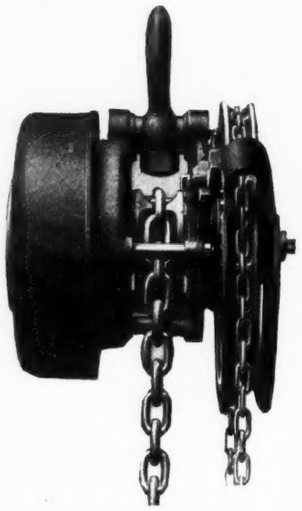
FORD TRIBLOC

is used, because the Tribloc is provided with the patented Loop Handle Chain Guide, which prevents over-riding of the Hand Chain and insures a safe and easy-running hoist.

Steel Parts are used instead of iron, thereby increasing the life and strength of the Block.

Eighty per cent of the power applied to the hand chain of a Tribloc is converted into lifting energy.

We guarantee Triblocs for five years—if they were not as strong and as good as it is possible to make a hoist, we could not do it.



Write today for new and comprehensive catalogue

FORD CHAIN BLOCK & MFG. COMPANY
137 Oxford Street **PHILADELPHIA, PA.**

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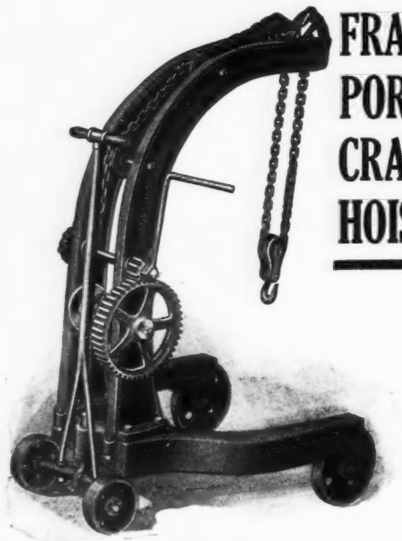


FRANKLIN PORTABLE CRANE & HOIST

Hercules was the wonder of his time—The "Franklin" is his representative in this day. Durable, Compact, Reliable, Portable—a source of satisfaction to your foreman and his men; saves time, saves effort, saves the back. No place in the shop is barred from it. The "Franklin" goes anywhere, in Railroad Shops, Machine Shops, Factories; wherever there are heavy weights, castings, machine parts, etc., to be moved from place to place.

Don't stay in a rut; let the Franklin Portable Crane and Hoist lift you out. An easier, quicker and more satisfactory way of handling your work.

Our illustrated catalogue will interest you.

THE FRANKLIN PORTABLE CRANE & HOIST CO.
FRANKLIN, PA., U. S. A.

CASE CRANES

have been sold to the largest manufacturers and transportation companies for many years. New orders constantly received from former customers give testimony to their satisfactory service under all kinds of working conditions.

The plant which covers five acres of ground, and which has direct track connection with five railroads, is situated so that raw materials are delivered to the different shops on the most economical basis, and as it is free from bonded debt or liabilities of any kind the burden of fixed charges is exceptionally low.

We are in business to supply CRANES AND HOISTS of proved merit, and we have equipped our shop both mechanically and personally to produce them on the most favorable basis possible. We are also prepared to figure on complete MONORAIL SYSTEMS, GRAB BUCKET OUTFITS and all kinds of special work that includes this class of apparatus.

The Case Crane & Engineering Co.
PAUL T. NORTON, Pres. Columbus, Ohio

MAKE YOUR PULLEYS A PERMANENT INVESTMENT

Do you buy pulleys with the expectation of discarding them as "worn out" after a given number of years' service? Those who use "American" pulleys need look forward to no such contingency.

We do not say "American" pulleys will *never* wear out. The oldest is not sixteen years old and *never* is a long time. But—

"AMERICAN" Steel Split Pulleys

Perfect in Principle Powerful in Performance

PATENTED

are proven *by test* the strongest and most durable of pulleys. They stand up under strains, service and blows that would "scrap" ordinary pulleys. They have gone through fires and been restored at slight expense. If an "American" pulley is no longer needed on one shaft, it will fit some other shaft just as well.

We can conceive of no normal pulley task that will wear out an "American."

Send postal today for instructive printed matter.

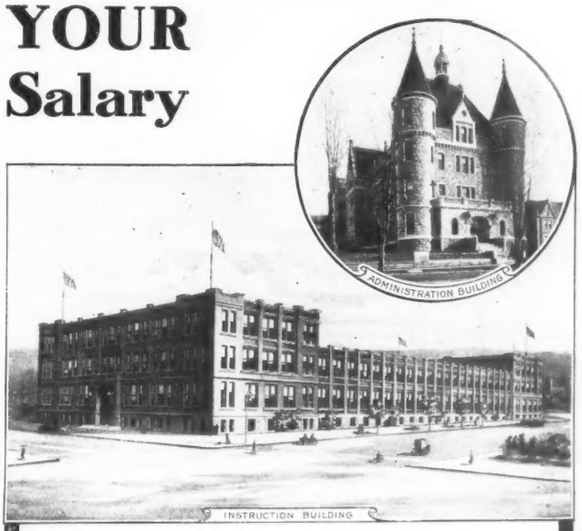
THE AMERICAN PULLEY COMPANY

OFFICE AND WORKS: PHILADELPHIA, PA.

Warehouses: New York, Cor. Grand & Greene Sts.
Boston, 165 Pearl St. Chicago, 124 S. Clinton St.

DEALERS EVERYWHERE

The I.C.S. Can Raise YOUR Salary



FOR more than 21 years the International Correspondence Schools have been training men for better positions and larger salaries. They can do the same for *YOU*—right in your *own home*, during your *spare time*.

Last year 5,143 I.C.S. students voluntarily reported promotions or increases in salary as a direct result of I.C.S. training. And thousands more were advanced who did not report.

What these men have done *YOU can do*. They had to face the same problems that now puzzle *you*. They had worked hard but had never got anywhere. They were tied down to unpleasant, poorly paid jobs. They were face to face with the increasing cost of living, with absolutely no hope of providing against it. And they had just as limited education, just as hard work, and just as little spare time as *you* have.

But they made up their minds that they would prepare themselves for better jobs. And with the help of the I.C.S. they have "made good." Today they are receiving three and four times their former salaries. Their work is a pleasure, and their opportunities for advancement are almost unlimited.

You've got just as much ability—just as high ambitions—just as stiff a backbone as these men had. What they have done, with the help of the I.C.S., *YOU can do.*

Mark and mail the attached coupon—it won't obligate you in the least—and the I.C.S. will show you how they can raise *YOUR* salary by training you for a good job in the occupation that is most to your liking.

Mark the Coupon—NOW

International Correspondence Schools

Box 980, SCRANTON, PA.

Please explain, without further obligation on my part, how I can qualify for the position before which I have marked X.

Electrical Engineer	Machinist	Chemist
Electrical Mach. Des.	Toolmaking	Assayer
Dynamo Foreman	Molding	Commer'l Illustrat'g
Electric Lighting	Blacksmithing	Bookkeeper
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Electrician	Stationary Engineer	Architecture
Telephone Expert	Gas Engineer	Contracting & B'ld'g
Concrete Construct'n	Refrigeration Eng.	Advertising Man
Mechanical Engineer	Sheet-Metal Drafts.	Window Trimming
Machine Designer	Marine Engineer	Automobile Running
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Name _____

Street and No. _____

City _____ *State* _____

Present Occupation _____

Genuine Armstrong Stocks & Dies

Are Made Not Only to Cut Pipe

BUT BOLTS AND ROD AS WELL

Users can purchase extra bolt dies and bushings which will fit the Genuine Armstrong Stock from any first class dealer.

HINGED PIPE VISES

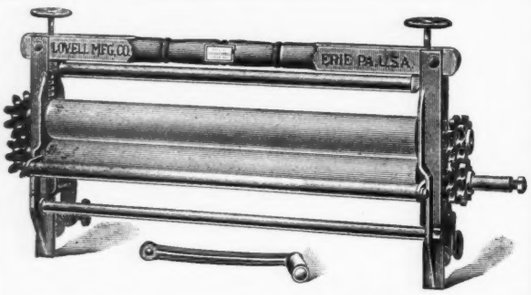
WATER, GAS & STEAM FITTERS' TOOLS

Manufactured by

THE ARMSTRONG MFG. CO., 297 Knowlton St., BRIDGEPORT, CONN.

NEW YORK CHICAGO

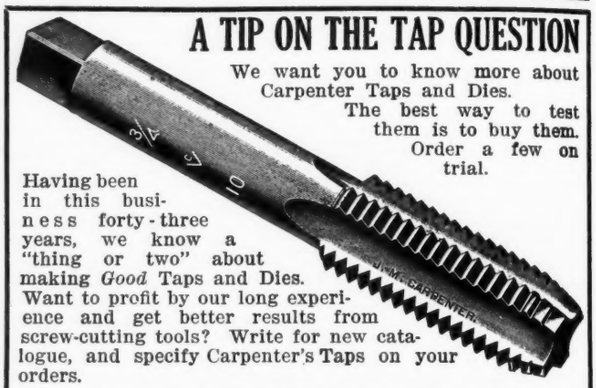
PRESERVE YOUR PRINTS



"Anchor Brand" Blueprint Wringers take the "curl" out of prints, make them more easily read, file better and last longer. These wringers are durable—the rubber rolls are held in a well-made frame and clamps are provided to fit any tank. Prices on request.

LOVELL MANUFACTURING CO.
ERIE, PENNSYLVANIA, U. S. A.

A TIP ON THE TAP QUESTION



We want you to know more about Carpenter Taps and Dies. The best way to test them is to buy them. Order a few on trial.

Having been in this business forty-three years, we know a "thing or two" about making *Good* Taps and Dies. Want to profit by our long experience and get better results from screw-cutting tools? Write for new catalogue, and specify Carpenter's Taps on your orders.

The J. M. CARPENTER TAP & DIE CO.
PAWTUCKET, R. I.

NOT BECAUSE IT'S

SAWYER

BUT BECAUSE IT'S SO!

HIGH GRADE MACHINISTS TOOLS

Many Good Things for Machinists

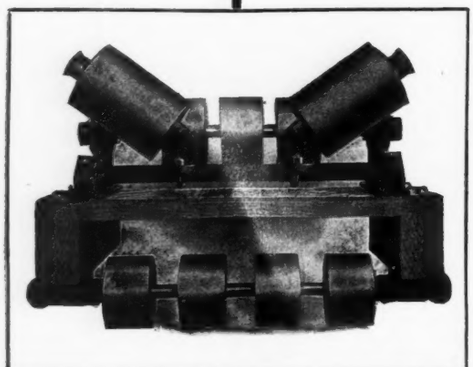
ARE CONTAINED IN

"THE SAWYER BULLETIN"

FREE SUBSCRIPTION

ASK FOR CATALOG DESCRIPTIVE OF THE COMPLETE SAWYER LINE

THE SAWYER TOOL MFG. CO.
ASHBURNHAM, MASS.

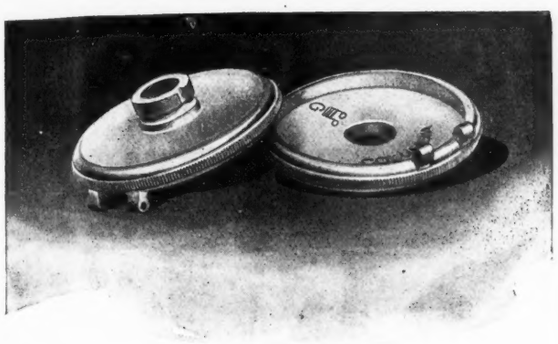


Improved Belt Conveyers

We manufacture Improved Belt Conveyers of several styles, troughing the belt or running it flat, as conditions may warrant. These conveyers are economical of power, simple in design, capable of running 24 hours per day, and require little time or attention from any one. There's no harm in writing us. *Send for Catalogue No. 34.*

H. W. Caldwell & Son Co. Western Ave. 17th-18th St. **Chicago**

NEW YORK: Fulton Bldg., Hudson Terminal, 50 Church St.



Reproducer Head
MADE FOR THE AMERICAN GRAPHOPHONE CO.

Our methods and processes for producing die-castings are generally conceded to be the most reliable and efficient known. Our machines have been adopted by the leading manufacturers and die-casting companies in this country and in continental Europe and England. Our product is used exclusively by those who demand the best that can be made.

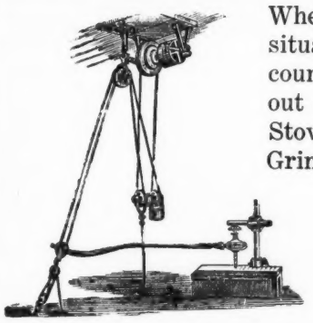
Send for our latest booklet, "Successful Die-Casting."

DOEHLER DIE-CASTING CO., Brooklyn, N.Y.

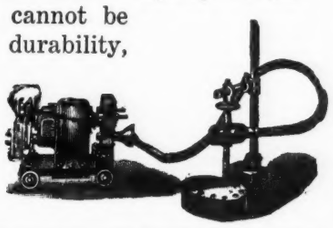
Branches: DETROIT, CHICAGO, PHILADELPHIA

"Judge them by the companies that use them."

In the Country or in the City



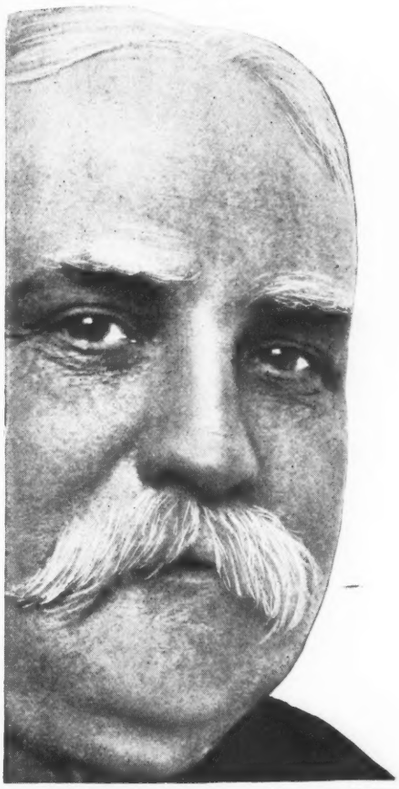
Whether your plant is situated in the city or country, with or without electric power, Stow Flexible Shaft Grinding, Polishing and Drilling outfits may be used. They take power from line-shaft, steam, compressed air or electric motor and will work in corners where nothing but a flexible shaft could be used. The Stow Shaft is made of tightly wound wire cable and cannot be surpassed for durability, strength and flexibility.



There's a Stow outfit that will help reduce the production expense of some job in YOUR shop. Pick it out from our catalogue.

STOW FLEXIBLE SHAFT COMPANY

26th and Callowhill Streets, PHILADELPHIA, PA.



I Want To Send You Some "Ads" Our Customers Wrote

They're a blamed sight better than we ourselves can write, although perhaps not quite so modest. These "ads" are in the form of fifteen letters from fifteen firms, whose unbiased opinion should mean something to every man interested in reducing the friction load in his plant.

They tell what

SELLS Roller Bearings

have accomplished in these fifteen plants, which are representative of hundreds of others throughout the country.

I'll send you the fifteen letters all at once, so that you may read for yourself what others are accomplishing with SELLS Roller Bearings.

Send me your name and the address to which you want them delivered and I'll send them out in the first mail. Take a minute right now—it's worth it.

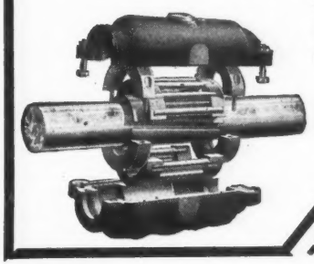
JOHN D. SELLS, *Manager.*

Royersford Foundry & Machine Company

54 North 5th Street Philadelphia, Pa.

Power Transmission Machinery, Punching and Shearing Machines.

EUROPEAN OFFICE: Theodore Butler, Ltd., 149 Queen Victoria St., London, E. C.



"ROLLERINE" the high-grade Bearing Lubricant.

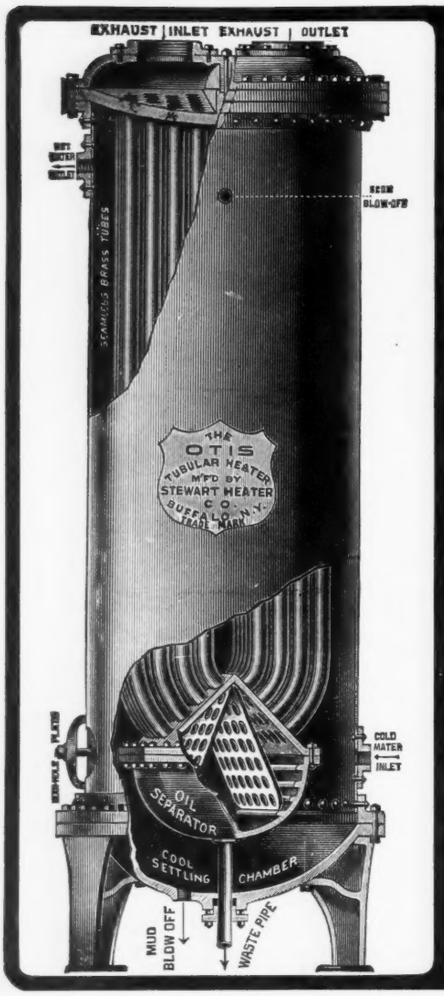
--- TEAR OFF AS A MEMORANDUM TO WRITE ---

Gentlemen: Without obligation, send me the "ads" your customers wrote.

Name .....

Address .....

M. 8-13



THE OTIS

Tubular Feed Water Heater, Oil Separator and Purifier

is not an experiment, but a tried and trusted appliance that the makers are not afraid to

GUARANTEE

To heat the feed water to the *boiling point* (210 to 212 degrees) with the exhaust steam without causing any back pressure; *also to extract the oil from the exhaust,* so that the exhaust steam after being passed through the heater can be used for heating purposes, and the water of condensation for the heating system be returned to the boiler without the *additional expense* of an *eliminator.*

We are so sure of the OTIS that we agree to pay all costs of a trial—freight, cartage, piping, etc.—if it fails to do all we claim for it.

Catalogue and Prices at your Service

The Stewart Heater Company

79-99 East Delevan Avenue BUFFALO, N. Y.

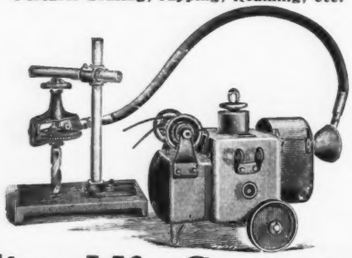
Combination of

Stow Flexible Shaft

and

Multi-Speed Electric Motor

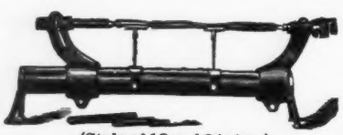
Portable Drilling, Tapping, Reaming, etc.



Stow Mfg. Company

BINGHAMTON, N. Y.

Selson Engineering Co., 85 Queen Victoria St., London, Eng. General European Agents



(Style of 12 and 24 sizes)

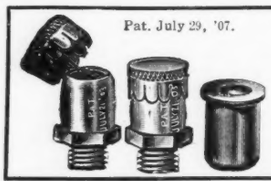
Measuring Machines

Measuring screw, 10, 16 or 20 threads to the inch, graduated to read thousandths or 32nds without calculation.

THE ONLY MICROMETER THAT WILL NOT LOOSE ITS ACCURACY BY WEAR.

Syracuse Twist Drill Co., Syracuse, N. Y.

Chas. Churchill & Co., London, Eng., Agents for Great Britain



Pat. July 29, '07.

HANDY OIL AND GREASE CUPS

No plugging up.
Oil tight and dust proof.

BAY STATE STAMPING CO.

WORCESTER, MASS.

European Agents.: Chas. Churchill & Co., London, Eng.

Send For Estimates.

DROP FORGINGS,

Iron, Tool Steel, Machinery Steel, and Copper.

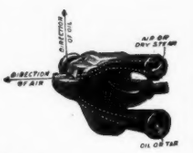
THE WYMAN & GORDON CO.

WORCESTER, MASS. CLEVELAND, OHIO.

There is nothing better than the Best

Oil and Tar Burners for Locomotive, Marine and Stationary Boilers.

Furnaces for Melting and Heat Treatment of Metals.



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TRADE MARK
Recorders

For Measuring
Pressure — Temperature
Speed and Time

The Latest and Best by
Every Test

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THE INDUSTRIAL INSTRUMENT CO.
FOXBORO, MASS., U. S. A.
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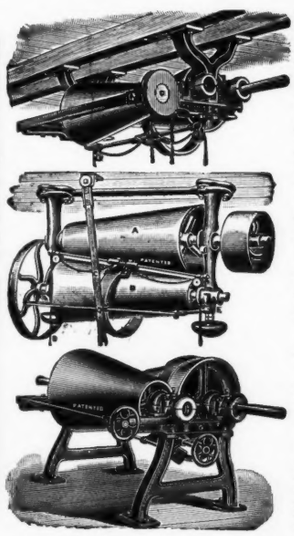
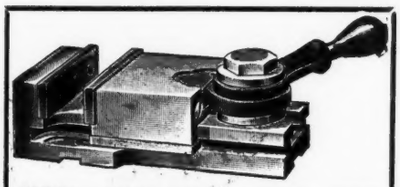
Evans Friction Cone Pulleys
VARIABLE SPEED COUNTERSHAFTS



Will drive your machine at any desired speed from 1 to 6. Over ten thousand sets in operation in this country and Europe. Send for Catalog. G. F. Evans, Newton Center, Mass.
FOREIGN AGENTS: A. Warden & Co., 45 Shepherdess Walk, London, E. C.



QUICK OPERATING LEVER VISE

Of excellent design and thoroughly well made.
You can rely on it for satisfactory service.
A trial will convince you.
We shall be glad to send full details.

The Carter & Hakes Company
Sterling Place, WINSTED, CONN.

ORIGINAL
ROCKWELL FURNACES
For ANNEALING, TEMPERING,
HARDENING, MELTING, Etc.
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Wherever a Leather Belt Can be Operated to Advantage

a Gilbert Wood Split Pulley can be used successfully. Style A, illustrated, is built for extra heavy service—main drives, trip-hammers, dynamos, etc. We guarantee

STYLE A

GILBERT WOOD SPLIT PULLEYS

for the work specified—no matter how severe the requirements. Being much lighter than either solid or split iron or steel pulleys, less expensive shafting and hangers may be used with equally satisfactory results. Less weight on the bearing reduces frictional loss in power, and the hard maple wood rim assures perfect belt contact and allows the pulley to run with absolute safety, at from two to three times the speed of the best iron pulleys.

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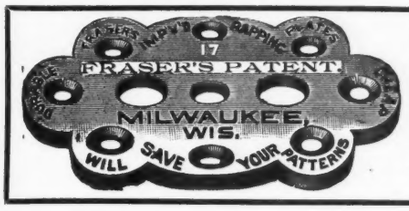

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Write for list of Pattern Makers' Specialties.

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Screw-cutting tools of every description bearing the "Brubaker" stamp can be counted on to give entire satisfaction. Order a few from our catalogue now and get better results.

W. L. Brubaker & Bros.
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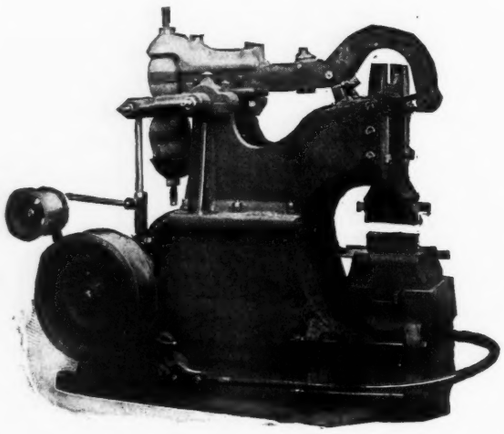

Bradley Upright Hammers

Are made with heads weighing 15 to 500 pounds. Each contains one-third to one-half more material than those of any other make of the same rating.

Their anvil blocks weigh nearly or quite double those of other hammers.

Their output is guaranteed 25 per cent. greater than is possible with other hammers of same rating or no sale.

More Bradley Hammers are sold each year than all other power hammers combined.

WE MAKE

The Bradley Cushioned Helve Hammer. The Bradley Upright Helve Hammer.
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Forges for Hard Coal or Coke.

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FOREIGN AGENTS: Schuchardt & Schutte, Berlin, Vienna, Stockholm, St. Petersburg, Alfred H. Schutte, Cologne, Brussels, Liege, Paris, Milan, Bilbao. Buck & Hickman, Whitechapel Road, London.

Mechanics with years of experience who used

The Barber Ratchet Brace

when they were young are still using the same tool because of its many good qualities.

Our latest pattern, Nos. 30 to 34, includes every feature that can in any way add to convenience and durability. It is free acting and non-splitting; has ball thrust forged steel jaws and will outlast the average brace two to one.

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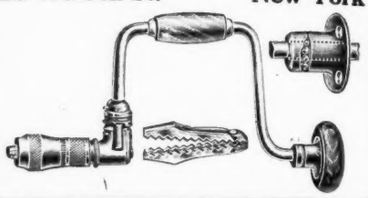
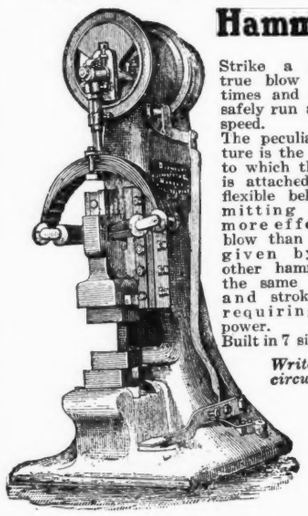


"Dead Stroke" Power Hammers



Strike a square, true blow at all times and can be safely run at high speed.

The peculiar feature is the spring, to which the ram is attached by a flexible belt, permitting a far more effective blow than can be given by any other hammer of the same weight and stroke, and requiring less power.

Built in 7 sizes.

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Dienelt & Eisenhardt, Inc.
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TWENTIETH CENTURY BALANCING TOOL

Always level and ready for use, no matter where or how you place it.

A practical tool for balancing pulleys, cones, armatures, polishing wheels, etc.; requiring no leveling or adjusting, it embodies great labor-saving features. No machine shop or polishing room can afford to be without this tool.

Made in four sizes to swing from 22" to 8-ft.

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3300 lbs. Railroad Pattern

CHAMBERSBURG STEAM HAMMERS

"All sizes for every class of work"

Economical — Reliable — Efficient

Our hammers are double acting, and have most simple valve gear, giving operator perfect control. Write us for any data needed as to your requirements in this class of equipment.

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CHAMBERSBURG ENGINEERING CO.
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The HIGLEY

COLD METAL SAW

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The "Strong Man" of the Shop

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Dudgeon Hydraulic Jacks

They are made of the right "mettle"; lift weights up to 530 tons, are durable, safe and thoroughly reliable. There's a Dudgeon Jack for all kinds of work — in repair shops, locomotive works or wherever heavy weights are to be lifted. You can get a Dudgeon to fit your needs in all respects.

Dudgeon Jacks have one pressure valve and two suction valves in a single valve chamber. Other double pump jacks have three passages between the pressure chamber and reservoir, each closed by a single valve, the failure of any *one* rendering the jack useless.

Dudgeon Hydraulic Jacks

have but *one* passage containing three valves, any one of which can perform the duty of all three when occasion demands.

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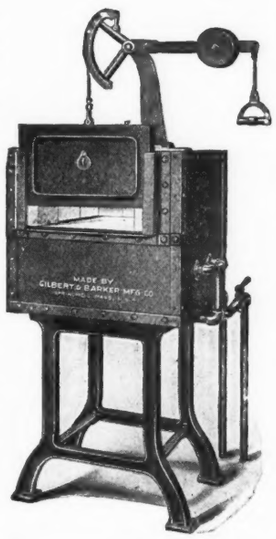
Many users of tool steel are paying a profit on the hardening of their own work because they are not equipped to harden economically. But economical hardening is scientific hardening, which can be done as safely in your plant, and far more conveniently and quickly.

Gilbert & Barker Gas Furnaces bring to you the scientific accuracy and the dependability of forty-six years' experience. An equipment just small enough or just large enough for your needs.

Do you pay a profit on your own work?



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Established 1865
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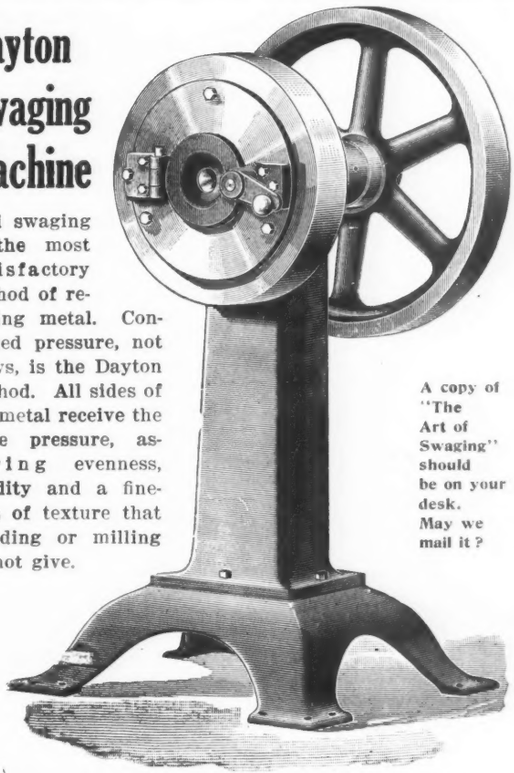
Dayton Swaging Machine

Cold swaging is the most satisfactory method of reducing metal. Continued pressure, not blows, is the Dayton Method. All sides of the metal receive the same pressure, assuring evenness, solidity and a fineness of texture that grinding or milling cannot give.



A copy of "The Art of Swaging" should be on your desk. May we mail it?

The Excelsior Needle Co., Torrington, Conn.

Coventry Swaging Co., Ltd., White Friars Lane, Coventry, England, Agents for Great Britain. Fenwick Freres & Co., 8 Rue de Rocroy, Paris, France, Agents for France, Italy, Belgium, Spain, Portugal and Switzerland.

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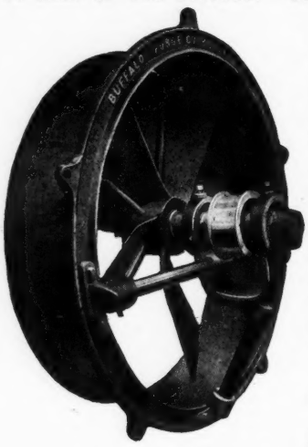
Clear the air—

Sanitation demands that we breathe fresh, pure air.

Buffalo Disk Fans

will clear up the atmosphere in a surprisingly short time and reduce the inside temperature to that of the outside. One small 18" Buffalo Propeller Fan will remove 3200 cubic feet of overheated, smoky, or fume laden air in one minute.



We furnish these Buffalo fans equipped for motor or pulley drive. Our Booklet, No. 175-O, will be found instructive. Send for it today.

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All types and sizes.

Single Frame—200 lbs. and up

Steam Drop—600 lbs. and up

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Also special hammers for forming steel wheelbarrow trays, drag scrapers, etc., etc

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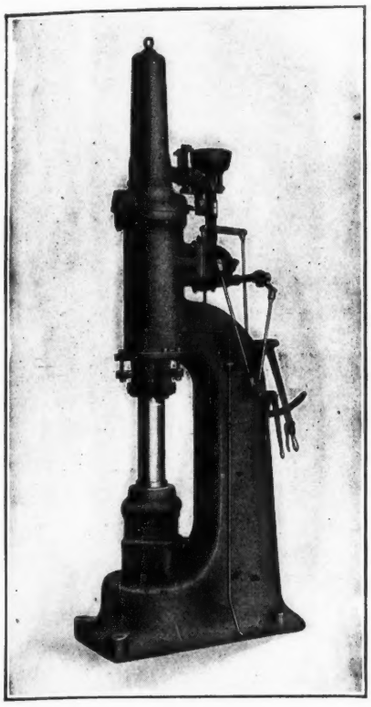

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STEAM HAMMERS

Single and Double Upright

Long stroke.
Large cylinder capacity.
Take steam above and below piston.
Quick acting bar under thorough control.
Bar guided in upper and lower cylinder heads.
Guides not required below cylinder.
Exhaust free from back pressure.
Piston valve out of way of cranes.
Nominal capacity is actual weight of falling mass.

Tool Grinders Drill Grinders
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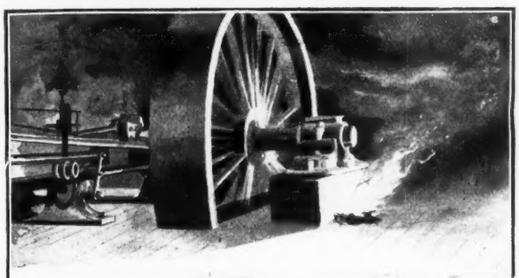


SPONTANEOUS COMBUSTION

ALL you need is a little oil on some waste, and the stage is all set for spontaneous combustion.

If you use oil, some of it is bound to leak out, and unless you want a dirty mess around the engine-room, waste or sawdust has to be used to collect it and a fire is liable to start at any time.

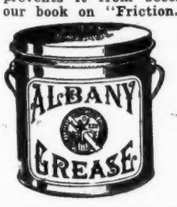
This cannot happen with

ALBANY GREASE

For it feeds in only enough lubricant to meet the requirements of the bearings, not enough to leak out, not enough to require any waste to soak it up, and all danger of fire is eliminated.

And at the same time, Albany Grease affords superior lubrication because enough pure lubricant is always fed to keep the journals and bearings from coming into metallic contact.

The other superior points of Albany Grease, such as its freedom from adulteration, its peculiar composition which prevents it from becoming rancid, etc., are described in our book on "Friction." Write for a copy, also ask for a can of Albany Grease and a grease cup.



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ALBANY LUBRICATING CO.
ADAM COOK'S SONS, Props.
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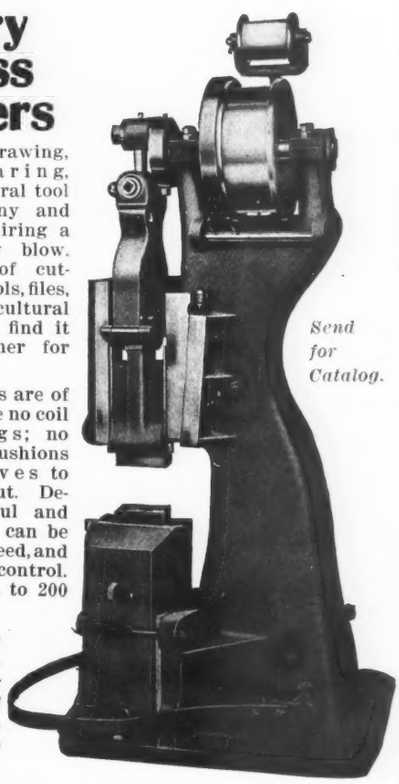
Beaudry Peerless Hammers

For Plating, drawing, swaging, collaring, spindle and general tool making, and any and all forging requiring a quick, snappy blow. Manufacturers of cutlery and edge tools, files, shovels and agricultural implements will find it the ideal hammer for their work.

All working parts are of steel. There are no coil or leaf springs; no straps, rubber cushions or wooden helves to break or wear out. Delivers a powerful and cushioned blow; can be run at a high speed, and is under perfect control. In sizes from 25 to 200 lbs. Rams.

We also make the Beaudry Champion Hammer for General Forging in sizes from 50 to 500 lbs. Rams.



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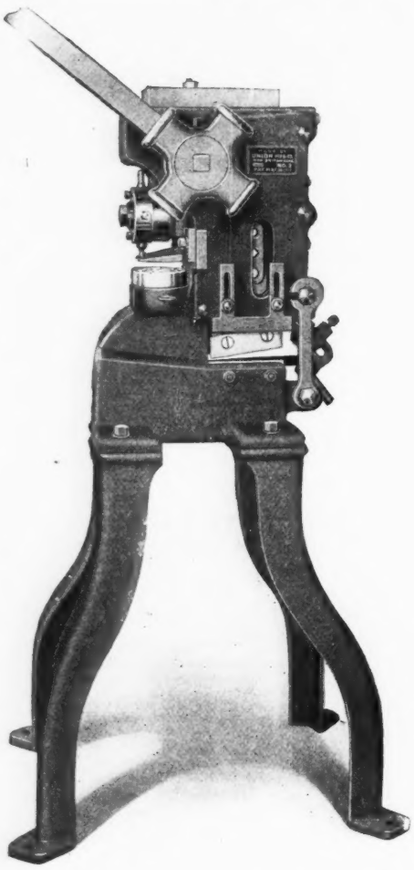
BEAUDRY & COMPANY, Inc.
141 MILK STREET
BOSTON, MASS.

The Union Combined Punch, Shear and Rod Cutting Machine



YOUR every requirement in the line of a hand-operated machine will be found in the three sizes shown in our catalogue.

Small size No. 1.—For Bench or Vise use, very desirable for a Pattern Room.

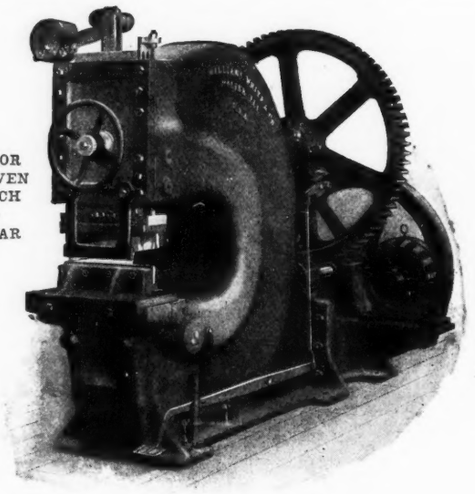
Medium size No. 2.—This is the size shown in cut and adapted to the needs of the general manufacturer or toolmaker.

Large size No. 3.—A powerful machine, designed for the blacksmith or machine shop.

Complete catalogue gives all details of sizes, capacities, etc.

Union Manufacturing Co.
New Britain, Conn., U. S. A.
26 Cortlandt Street, New York

MOTOR DRIVEN PUNCH AND SHEAR



Electric Drive for Shearing and Punching Machines

is popular and efficient. Moline machinery is readily fitted with individual motor drives, and this, combined with the well-known advantages of great strength, capacity and power, makes these machines readily adaptable to all conditions of service. *Catalogue shows many classes of Forging Machinery, Shearing and Punching Machines of all descriptions. Want a copy?*

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MOLINE, ILLINOIS, U. S. A.
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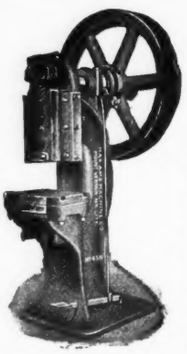

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ECONOMY

We'll guarantee to furnish you with the right kind of **Power Presses** at right prices.

All machines are **tested** and pass **rigid** examination before leaving the factory, consequently we give the most **liberal** guarantee.

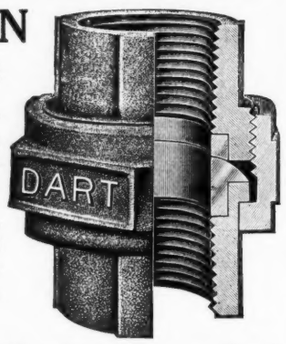
Standard dimensions in certain cases may be modified to meet special requirements. Any questions you would like to ask?

MAX AMS MACHINE COMPANY, Mount Vernon, N. Y., U. S. A.
CHARLES M. AMS, President

DART UNION
2 BRONZE SEATS 2

Ground together are absolute protection against rust and corrosion—won't leak.

Made in Ells, Tees, Union Flanges, M and F and Air Pump Unions. Send for sample — ask questions.



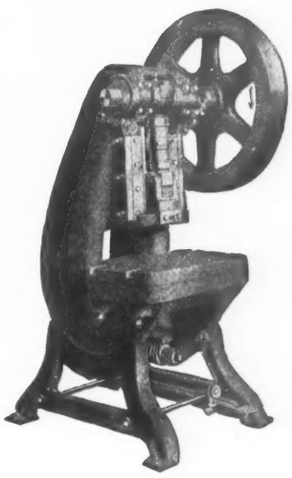
E. M. DART MFG. CO., Providence, R. I.
The Fairbanks Co., Sales Agents. Dart Union Co., Ltd., Toronto, Canada.

Bliss Presses For Every Requirement

Bliss Inclinable Presses

Adapted for

nearly all operations required in the economical manufacture of tin cans, pieced tinware, metal packages, electrical goods, brass goods, trimmings, etc.



For more than thirty years manufacturers of sheet metal goods have been using Bliss Inclinable Power Presses. During that time, of course, the Presses have been greatly improved. For convenience, durability and wide range of usefulness they are more than equal to any on the market. The design combines greatest strength and rigidity with convenience for handling dies and material. It can be quickly changed from upright to inclined position. All adjustments are easily made and convenient.

18 Sizes—all in stock

For particulars send for Catalogue No. 1K.

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Representatives for Chicago and Vicinity: Stiles-Morse Co., 565 West Washington St., Chicago, Ill. Offices in Europe: 100 Blvd. Victor Hugo, St. Ouen, Paris; Pocock St., Blackfriars Road, London, S. E.

$200.00 IN GOLD

THE intelligent user of machines and tools will notice opportunities for improvements, from his own point of view, which may have been overlooked by the manufacturers, and, being broad-minded, he would not hesitate to give his brethren the benefit of them, if he had an opportunity.

You may have ideas regarding new, useful *Machines and Tools for Sheet Metal Workers*, or as to improvements on existing ones. Why not enter the

Niagara Prize Competition

$200.00 will be distributed among those who submit to us the best suggestions before November 1st, 1913: 1st prize, $100.00; 2nd prize, $40.00; 3rd prize, $25.00; 4th prize, $15.00; 5th and 6th prizes, $10.00 each in Gold.

The suggested ideas may be big or little—it is their importance and scope that count, and it is not essential that the ideas are worked out—this is our business.

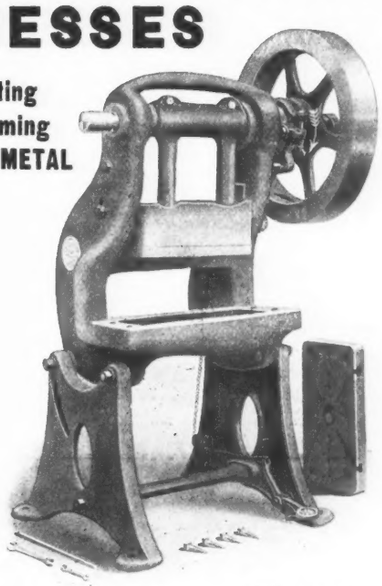
The merits of the suggestions will be passed upon by a competent committee, and the names of the six prize winners will be published in these columns in January, 1914.

Presses, Shears, Tinsmiths' Machines, Punches, Rolls, etc.

Niagara Machine & Tool Works
BUFFALO, NEW YORK
Manufacturers of Tools for Sheet Metals

FERRACUTE PRESSES

For Cutting and Forming SHEET METAL

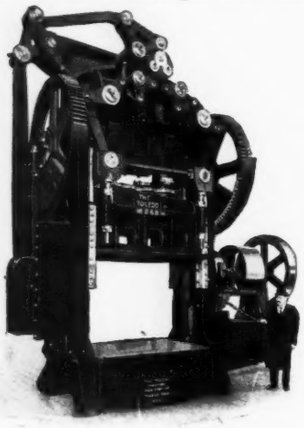


Press ST 25

The press shown is adapted for cutting and perforating light sheet-metal of comparatively large area. Also built straight-sided instead of throated. Both forms inclinable. Several sizes. *Photographs and full information on request.*

FERRACUTE MACHINE CO., BRIDGETON, N. J.

We have anticipated the demands of manufacturers with the new

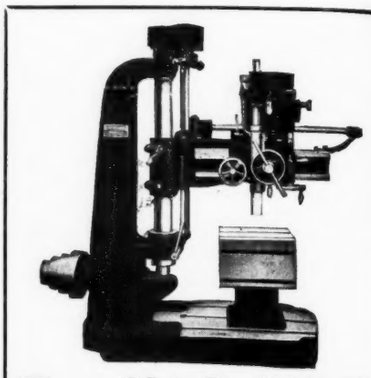


No. 26814. Weight 135,000 lbs.

"TOLEDO"
DOUBLE CRANK TOGGLE

simplicity of design and extreme accuracy of manufacture meaning a larger output of higher quality.
For drawing and forming automobile fenders of the latest types—box covers, under pans, stove tops, etc.—they have no equal.
The advantages of this press are above argument.
Built in a large number of sizes, with capacity suited to the greatest variety and range of work. Patent applied for.

The Toledo Machine & Tool Co.
TOLEDO, OHIO, U. S. A.

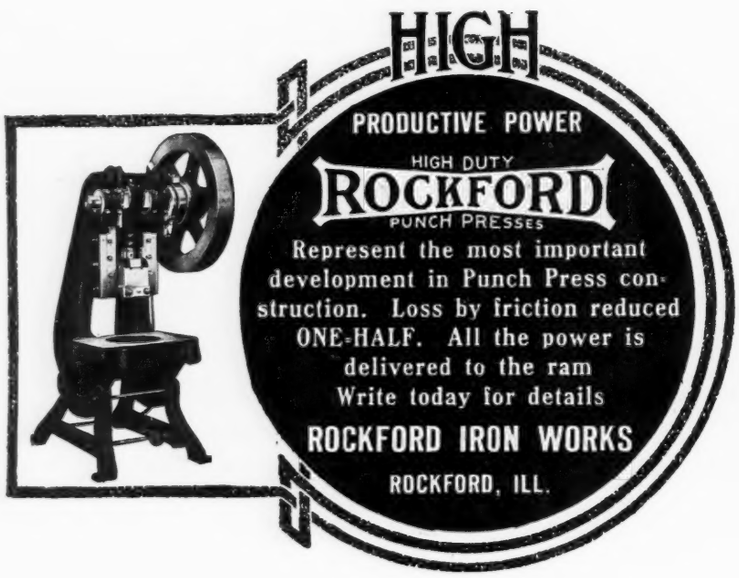


Morris Plain Radial Drills

Base and main housing one massive casting; box section, exceptionally rigid. Column swings with arm in very large bearings. Every convenience—depth gauge, automatic stop, safety trip, etc. Strength and rigidity strongest points. 2½, 3 and 3½-foot sizes. *Ask for latest circular.*

THE JOHN B. MORRIS MACHINE TOOL CO.
Cincinnati, Ohio, U. S. A.
Also Manufacturers of MORRIS Engine Lathes

OUR SPECIALTY:
Automatic Machinery for making Wood Screws
Asa S. Cook Co., HARTFORD, CONN., U. S. A.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PRODUCTIVE POWER
HIGH DUTY
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PUNCH PRESSES
Represent the most important development in Punch Press construction. Loss by friction reduced ONE-HALF. All the power is delivered to the ram
Write today for details
ROCKFORD IRON WORKS
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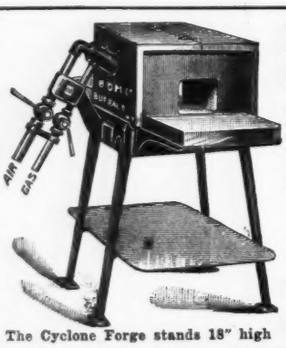
PATTERN WORK

on a CRESCENT Universal Wood Worker is five times easier than handling your patterns on different machines.

Save time by conveniently doing your pattern work on the CRESCENT. It combines a band saw, jointer, single spindle shaper, saw table and borer in one machine.

Save in the lower investment price of one instead of five machines for your work.

THE CRESCENT MACHINE COMPANY
56 Main Street LEETONIA, OHIO



The Cyclone Forge stands 18" high

Ever Use Gas for Forging or for Hardening Dies or Cutters?

Here's a Gas Forge which will heat an inch iron bar quickly, but is under such perfect control that the smallest cutter or die may be tempered in it without injury. Its usefulness extends to all operations of heating and hardening lathe tools, end mills, milling cutters, dies, case hardening, etc., etc., with greater facility and perfection than with an ordinary forge. Made for illuminating or natural gas.
If interested ask for further information.

PRICES

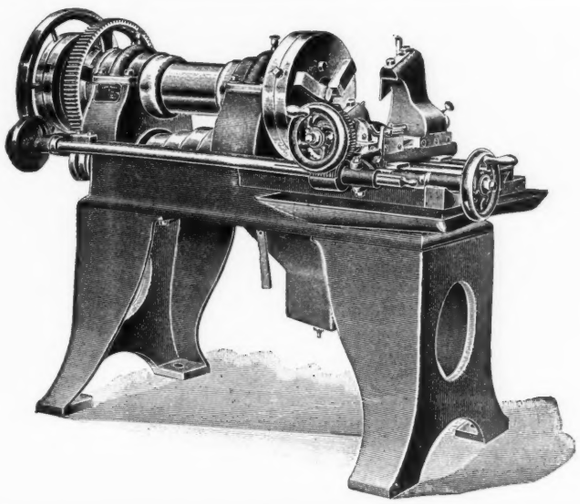
No. 19, with opening 3" x 2½" x 9" deep $10.00
No. 19-A, with opening 6" x 5" x 9" deep 16.00
$2.00 extra when fitted for natural gas.

Write for Catalogue "B.M"—full of information for all machine shops.

BUFFALO DENTAL MFG. CO., Buffalo, N. Y., U. S. A.

"ON THE LEVEL"

You see in an instant just "where" your work is out by using the "WhichWay" Pocket Level, size of a silver dollar, ⅜ in. thick, neatly nickeled.
Sample for thirty 2-cent stamps. Caliper catalog free. E. G. SMITH, COLUMBIA, PA., U. S. A.
Liberal Inducements to Agents.



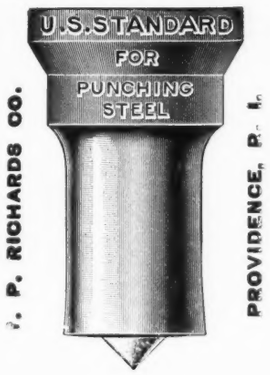
Clean, Fast Bar Cutting

The Hurlbut-Rogers Cutting-off Machine does its work twice as fast as the ordinary cutting-off machine—takes *two cuts*, one up and one down at the same time, and the accuracy of cut is assured by a well-constructed machine.

A 3" bar of machine steel may be cut in two minutes and six seconds, including chucking, starting and stopping. Actual cutting time, one minute forty-five seconds.

Choose Hurlbut-Rogers Machines—save time, labor and money. Have we heard from you yet?

HURLBUT-ROGERS MACHINE CO.
SO. SUDBURY, MASSACHUSETTS



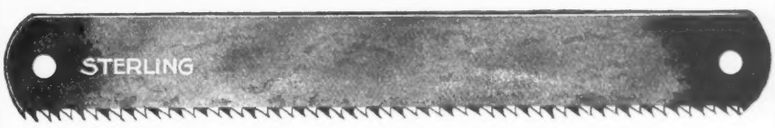
A MARVEL DRAW CUT
HACK SAW
IN THE SHOP MEANS
SATISFACTION

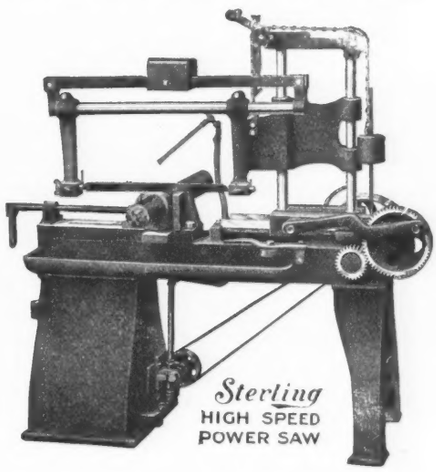
No. 1—Capacity, 4"x4", blade 12".
No. 2—Capacity, 6"x6" long stroke and 8"x8" short stroke. Blades 12" to 17", and swivel vise that swivels both ways. They saw fast.

Write to-day.

ARMSTRONG-BLUM MFG. CO.
343 N. Francisco Ave., Chicago, U. S. A.

HACK "STERLING" SAWS





Have no equal. Give them a trial.

MANUFACTURED BY
DIAMOND SAW & STAMPING WORKS
BUFFALO, N. Y., U. S. A.

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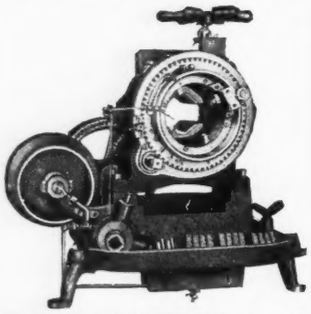
WE SPECIALIZE IN THE MANUFACTURING OF ALL KINDS OF
DRILLING AND MILLING JIGS AND FIXTURES
PROMPT DELIVERY GUARANTEED
THE COLUMBUS DIE, TOOL & MACHINE CO., COLUMBUS, OHIO

FORBES MACHINES CUT PIPE—AND COSTS

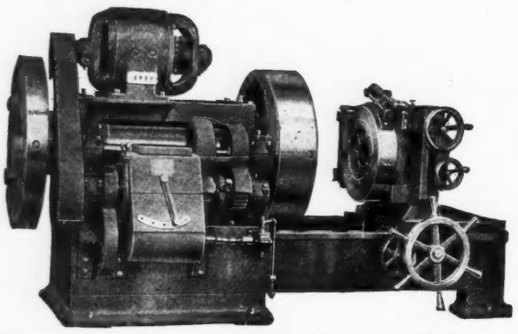


PIPE threads cut with a "Forbes" are right. There's no waste of time or effort—the machines work so economically that one man alone can thread and cut 12" pipe with the Forbes *Hand* Machine. Any machine that reduces labor and saves time is a good investment. Let a "Forbes" be *your* "Savings Bank."

Write for details.

THE CURTIS & CURTIS COMPANY, 8 Garden St., Bridgeport, Conn.

The Method of Drive is an Important Thing in a Pipe Machine



Because a lot of time is wasted if the speed is not just right for every size and material of pipe.

The "Stoever" Pipe Machine

Has a single-pulley drive with gear speed variation. This means that **the belt speed is constant**—not lowest when it should be highest. **The belt tension is always proportional to the power transmitted**—economy of power. **The belt contact is constant** and always adequate.

The "Stoever" has a friction countershaft which eliminates shifting belts and saves at least one-third in belting cost.

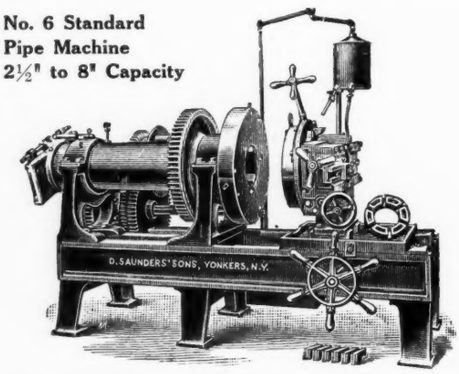
The gear speed variation affords a speed exactly right for every size of pipe, and for iron or steel. **This means maximum cutting and threading speed.**

Write for the "Economy" Booklets

Treadwell Engineering Co.

Sales Office, 92 West Street, New York
Works, Easton, Pa. TE 10

No. 6 Standard Pipe Machine 2½" to 8" Capacity



Pipe Threading and Cutting is Simplified by a "Saunders"

The simple design and strong, durable construction of Saunders Pipe Threading and Cutting Machines make them most economical to use. Plenty of power without large pulleys or tight belts; no loose gears; die head moves to one side to allow for cutting-off—an exclusive "Saunders" feature which prevents injury to chasers as the pipe does not pass through die head at all. Before purchasing a pipe threading and cutting machine investigate the "Saunders."

No. 6 cuts threads from 2½" to 8".
Complete catalogue on request.

D. Saunders' Sons, Yonkers, N. Y.

Pipe Threaders and Cutters

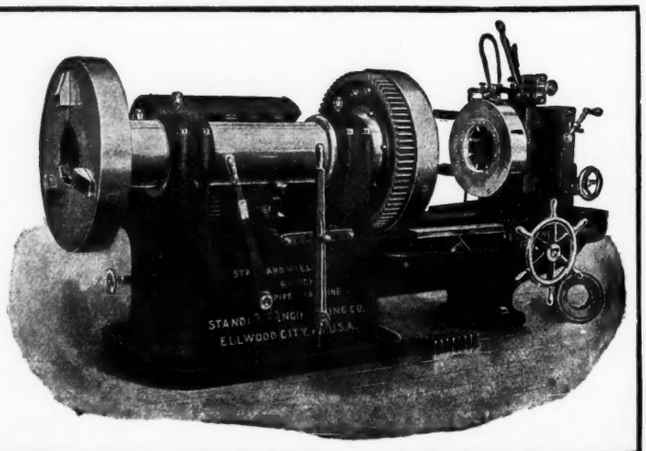
With efficiency as well as beauty

Heavy—none more so; bed cast in one piece, no stands nor legs to work loose. No oil-soaked floors; fire risk reduced.

Single speed pulley; all gear speed changes through semi-steel cut gears.

Deep chasers cutting long taper perfect threads in one cut as easily on steel as on iron pipes.

Let us prove to you that the higher cost of a modern tool is justified by the character and quantity of its product. *Circulars for the asking.*



STANDARD ENGINEERING COMPANY

ELLWOOD CITY, PENNA.

St. Louis Office: 1012 Chemical Building

N. B.

Retail Hardware Dealers

If you do not Stock What
Your Customers Want

YOU LOSE MONEY

The Demand today among
Users of Pipe Tools

IS FOR TRIMO TOOLS

Are They on Your Shelves?

Send for Catalog No. 38

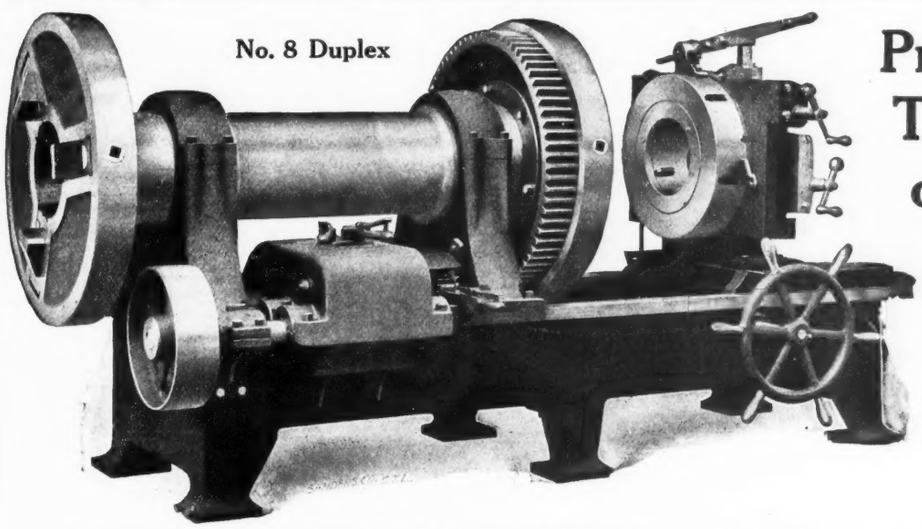
MADE BY

TRIMONT MFG. COMPANY
ROXBURY, MASS.

TRIMO PIPE WRENCH

TRIMO PIPE CUTTER

WITH FLAT-LINK OR CABLE CHAIN
TRIMO CHAIN WRENCH


No. 8 Duplex

Profitable Threading on B & K Machines

It pays to use machines whose reputation for good service is established. Finished product is better—shop standards are higher.

B & K Pipe Threading and Cutting Machines help increase profits. The Peerless Adjusting Mechanism reduces operating time to a minimum, and the expansion of the dies with first upward movement of the die lever positively prevents "chewed pipes."

When you have tried a B & K Pipe Threading Machine you will be better able to judge the truth of our statements. Let's get together on this matter; two heads are better than one. Write for details.

BIGNALL & KEELER MANUFACTURING CO., Edwardsville, Ill., U. S. A.

FOREIGN AGENTS: Chas. Churchill & Co., London, Birmingham, Manchester, Glasgow. Schuchardt & Schutte, Berlin, St. Petersburg, Vienna, Stockholm. Alfred H. Schutte, Cologne, Paris, Milan.

Agrippa

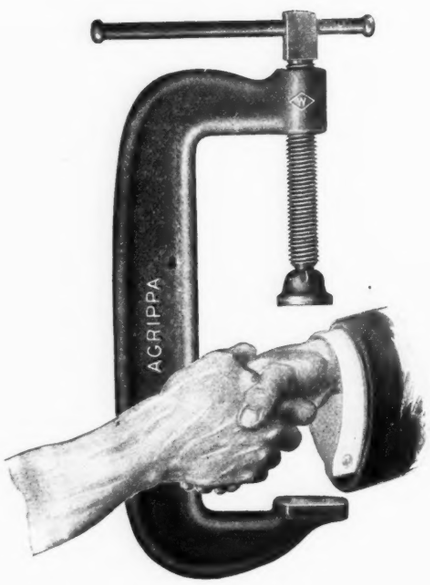
Drop-forged

Clamps

Made in 7 sizes, 5/8" to 18" capacity

Men who are buying for, or who influence the conduct of an establishment want the assurance of maximum service

You can't get it from a casting, and Drop-forged "Agrippa" Clamps which are less bulky, lighter and stronger may be bought for the same price as best steel casting kinds.



Dependable Tools Catalogue free.

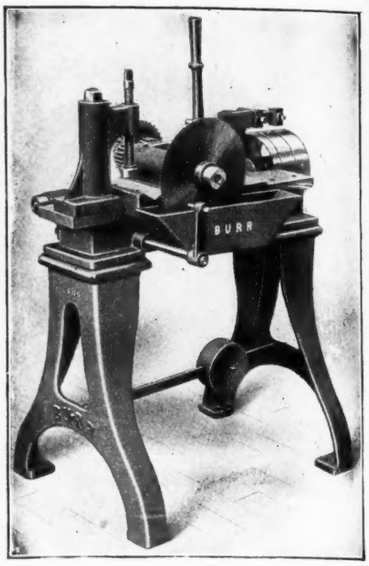
J. H. WILLIAMS & CO.

SUPERIOR DROP-FORGINGS

61 Richards Street Brooklyn, N. Y. City

40 South Clinton Street, Chicago

Burr No. 1 Cold Saw



Cuts Five Times Faster

than a power hack saw and does better work. This saw is a high-grade machine with capacity for cutting off round, square or other shaped stock up to 3½ inches. It is stiff, powerful, very rapid in operation and is equipped with an efficient saw grinding attachment. Write for catalogue giving other good points.

John T. Burr & Son

429 KENT AVE. BROOKLYN, N. Y.

THE SCHWERDTLE STAMP CO.,

STENCILS-BURNING BRANDS
STEEL STAMPS & DIES
SEALS-MACH. PLATES-CHECKS

BRIDGEPORT, CONN.

POWER

Is your Engine or Motor developing its full power? You don't know unless you know the speed you are attaining.

Why not determine this by taking readings occasionally with the

Veeder

SPEED COUNTER

Price $3.00 each
Fully Guaranteed

Circular on request

Straight Reading, Non-Magnetic, Ball Bearing, Clutch Mechanism which insures accurate readings.

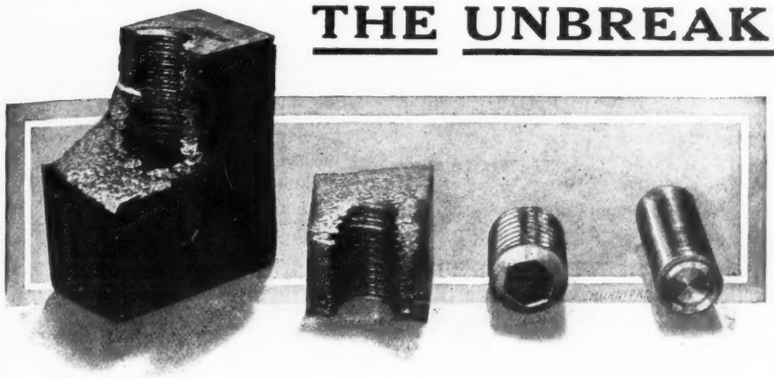
THE VEEDER MFG. CO.

39 Sargeant St., HARTFORD, CONN.

MAKERS OF

Cyclometers, Odometers, Tachometers, Tachodometers, Counters and Die Castings.

THE UNBREAKABLE ALLEN



When you force the Allen, something has to go. This time it was the block we confined it in. You see, we drilled and tapped the 1" hole clear through the block, put an **Allen Safety Set Screw** in each end, with a soft steel plug between. Then we applied the Allen wrench, supplemented with a long lever, and turned one of the screws in hard.

Result: Block broken in three pieces—steel plug upset and scored at each end, but **both Allen Set Screws intact.** All diameters from ¼" to 1" in stock. Specials up to any length. U. S. and V Threads.

Ask for Catalog No. 12.

THE ALLEN MANUFACTURING CO.
135 Sheldon Street, HARTFORD, CONN.
Canadian Factory: 29 St. David's Lane, Montreal.

COPPER HAMMERS
—FOR—
MACHINE SHOP USE

ALL SIZES

Will drive
work to place
without marring

THE EUREKA COMPANY
Formerly
EUREKA TEMPERED COPPER WORKS
NORTHEAST, PENNSYLVANIA

Rogers Reamers Carry Their Own Gauges

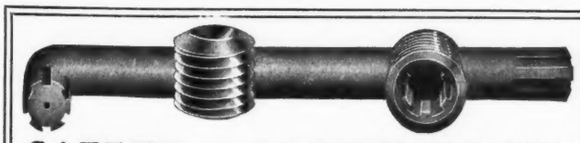
The shanks on Rogers Reamers serve as limit gauges and make the right sized hole a surety.

The blades are easily adjusted by driving them toward the shank, the cutting edges expanding to compensate for wear. Special blades that drive forward are furnished for bottoming in blind holes.

Small Tool Catalogue No. 8 sent on request.

THE JOHN M. ROGERS WORKS, INC.
Gloucester City, N. J.

FOREIGN AGENTS: Chas. Churchill & Co., Ltd., London, E. C. C. W. Burton, Griffiths & Co., London, E. C. De Fries & Co., Dusseldorf, Germany. V. Lowener, Copenhagen, Denmark.



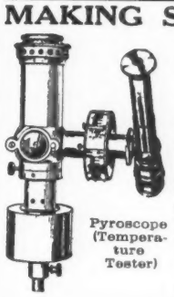
SAFETY and CONVENIENCE

Goodwin Hollow Set Screws are safe—do not project from shaft to catch and tear. Steel wrench is provided, but as the slots are opposite, screws may be set up with ordinary screwdriver.
Made from open hearth bar steel, strong and durable.

Ask for No. 14 circular.

GOODWIN HOLLOW SET SCREW CO.
25 West Main St. Waterbury, Connecticut

TESTING APPARATUS
MAKING SURE OF QUALITY



Pyroscope (Temperature Tester)

There is only one way to make sure of quality in the materials you buy, and in the products you sell—that is to test them. The two instruments shown herewith are the simplest and most economical for their respective purposes.

To determine how hard or tough is any metal—what is the resistance to wear or shock—you need the Shore Scleroscope. For control of tempering, annealing, or any other heating operation, the Shore Pyroscope is the practical device.

Write today for booklets fully describing the uses and benefits of these instruments.

Scleroscope World Standard (Hardness Tester)

Shore Instrument & Manufacturing Co., 555-557 W. 22d St., N. Y.

FOREIGN AGENTS: Schuchardt & Schutte, Berlin, London, Shanghai, Japan, Vienna, Stockholm, St. Petersburg, Copenhagen, Budapest. A. H. Schutte, Cologne, Brussels, Milan, Barcelona and Bilbao.

BARGAINS

NEW AND SECOND HAND **MACHINERY** TOOLS AND SUPPLIES

Send for List

MACHINERY

Frank Toomey
Inc.
127-131 N. Third St.
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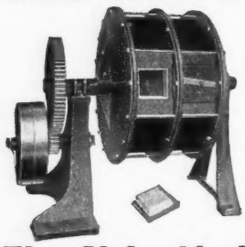
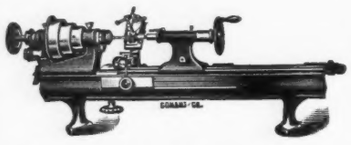
DON'T FORGET
Our Illustrated Monthly Stock List, when looking for good rebuilt machines.
THE MOTCH & MERRYWEATHER MACHINERY CO.
CLEVELAND DETROIT CINCINNATI PITTSBURGH

ARE YOU BUFFING SMALL PARTS?



This Barrel will do the work of ten men and will polish in crevices and depressions that a wheel will not touch. Burnishes small pieces in three to five hours.
Six sizes—$125.00 to $250.00, list.
New catalog "Mch" tells everything.
The Globe Machine & Stamping Co., Cleveland



Fine Machines For Fine Work

Toolmakers, electricians, model makers, machinists in all classes of accurate manufacture should know the advantage of

Stark Precision Lathes

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STARK TOOL COMPANY
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QUALITY REAMERS

Our one object is to make *good* reamers—a little better reamers than the ordinary. "Alvord" on a Reamer assures the buyer of a durable, strong, clean-cutting, accurate tool. You'll "bank" on "Alvord" after a trial. Catalogue?
ALVORD REAMER COMPANY, Millersburg, Pa.

MACHINE MOLDED CASTINGS
are conceded cheapest and best. We build the machines to produce them.
MUMFORD MOLDING MACHINE COMPANY
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Try to wrench the head off—
MR. MACHINIST--You know the danger of twisting the head off a set screw. Try this on a
MAC-IT SET SCREW
Set the steel block firmly in a vise, take a wrench and try your hardest to twist the head off. Your name, address, business and dealer's name brings test set free. *Test set FREE--pin ad to letterhead, give dealer's name and mail to us today.*
Strong, Carlisle & Hammond Co.
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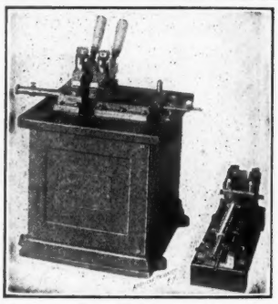
"THOMSON"

Thomson Electric welding produces a homogeneous weld — structure of metal unaltered. Operator has absolute control of heat at all times and accuracy is assured by efficient clamps. The process is instantaneous on small pieces and requires but a few seconds on larger stock. Write us if interested.

Thomson Electric Welding Co.
LYNN, MASS., U. S. A.
The Pioneer Manufacturers



Copper Wire Welder. Automatic Cut-Out. 3000 watts one second.

A. G. BUTLER
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For Iron and Brass Castings. Various styles and sizes. For Machines, Bridges, Tablets, etc.
Leather Fillet.
All sizes in stock.

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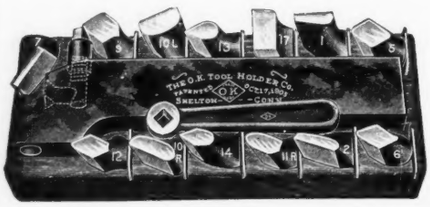
We Make a Device for Removing Broken Taps
Write for particulars.
THE WALTON CO., Hartford, Conn.

BRISTOL COUNTERS

Save cost of counting by hand, weighing, etc. Prevent over-production. Keep track of material used. Catalog 27.
C. J. ROOT CO., Bristol, Conn.



Send for our new catalogue and learn how to save money on Turning Tools.

THE O. K. TOOL HOLDER CO.
SHELTON, CONN., U. S. A.

THE CINCINNATI PRECISION LATHE COMPANY

Announces the following Change in Prices:

Standard Head Lathes—Including Countershaft—$150.00
Universal Head Lathes—Including Countershaft—$200.00

Increased facilities and simplicity of construction have made these prices possible without sacrificing quality. **Get your order in now.**

EXCLUSIVELY REPRESENTED BY:

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PRACTICAL COLD SAWING

If you use a Lea-Courtenay Cold Sawing Machine, it will increase your effective cutting range 55% over any other sprocket-driven saw with equal sized blade.

This No. 21 "Lea-Courtenay" cuts 8½-inch bar or a 20 x 6¼-inch I-beam with a 21-inch blade. Compare it with other sprocket-driven cold sawing machinery—we'll abide by your decision. *Details?*

LEA-COURTENAY CO., Inc., 90 West St. New York

SPRINGS

¶ We can handle your every requirement for high grade springs. We make them from steel, brass or phosphor bronze, either flat stock or wire.

¶ Special attention is given here to careful manufacturing and tempering and we invite your inquiries for goods having special requirements.

¶ All springs are made to order and guaranteed to be satisfactory.

Ask for Booklet 5-1.

The Wallace Barnes Co.
Bristol, Conn.

Cutting for Fun or Profit?

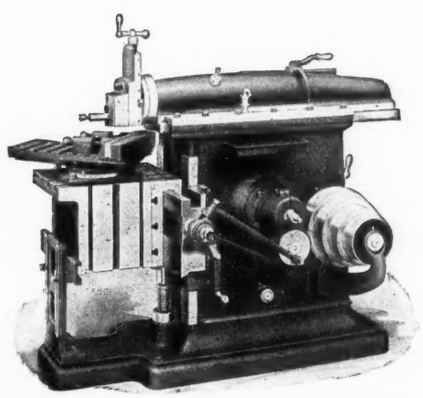
How does the work you send to the Shaper department come through? Is there profit in it? Are results perfectly satisfactory?

No matter how hard you are to please, the design, workmanship and general construction of "Kelly" Shapers will appeal to you at once, as will the quality and quantity of "Kelly" output. We have paid special attention to accuracy, believing that a shaper should, above all, be accurate and *stay* accurate.

"Kelly" Crank Shapers do not chatter on the cutting stroke, and planing to an exact line on heavy cuts is made possible by table supports which prevent sagging.

Ask for circular when you write.

The R. A. Kelly Company
XENIA, OHIO



THINK!

We are the ONLY shaper people who HARDEN or GRIND crank-pin or bull-gear hub; or HARDEN and GRIND all important shaft journals; or RING OIL all important radial bearings.

Crank-block is HARDENED, GROUND parallel in magnetic chuck, and hole is ground true.

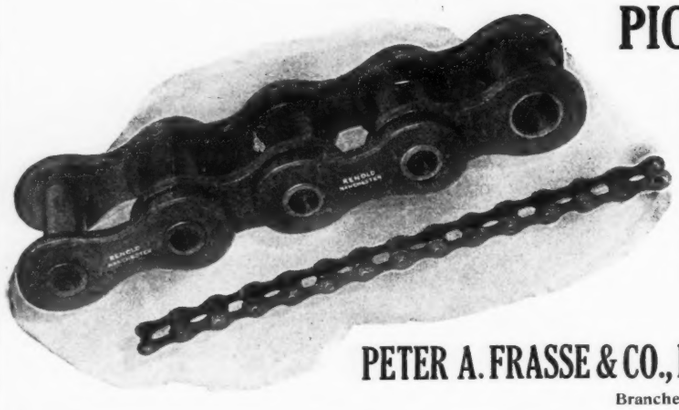
This shaper requires less care on part of operator, has longer life, and by reducing wear and friction, delivers maximum power to point of cutting tool.

Many other superior features that mean more accurate work and less cost of production.

Illustrated leaflets on request.

QUEEN CITY SHAPER COMPANY, Sta. V., CINCINNATI, OHIO, U. S. A.

FOREIGN AGENTS: Alfred Herbert, Ltd., Coventry; W. Steinhaus & Co., Bruxelles and Paris; F. G. Kretschmer & Co., Frankfurt, a/M.; Allied Machy. Co. of America, Turin.



PIONEERS—A CONTRAST

Too often have the pioneers opened up a great industry only to have others reap the benefits of their labor. A great contrast is presented by the makers of **RENOLD CHAINS.** First in the field as inventors of both Roller and Silent Chains, they still hold first place for quantity as well as quality of product. We illustrate a contrast in sizes, there is none in **QUALITY, ALWAYS THE BEST.**

Write today for special pamphlets and all information.

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Branches: BUFFALO, PHILADELPHIA

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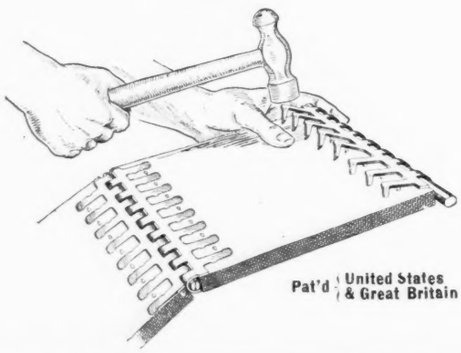

ALLIGATOR STEEL BELT LACING

is applied without special machines or tools. A hammer—three minutes' time—a perfect joint. And it works equally well on any kind of belting.

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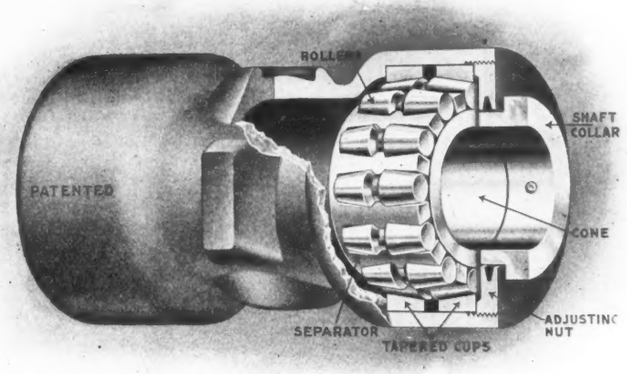

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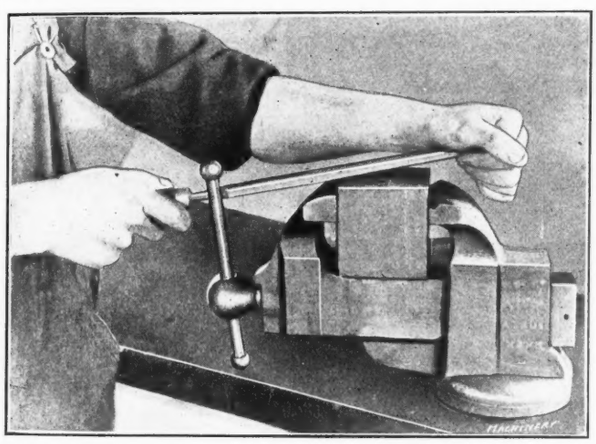

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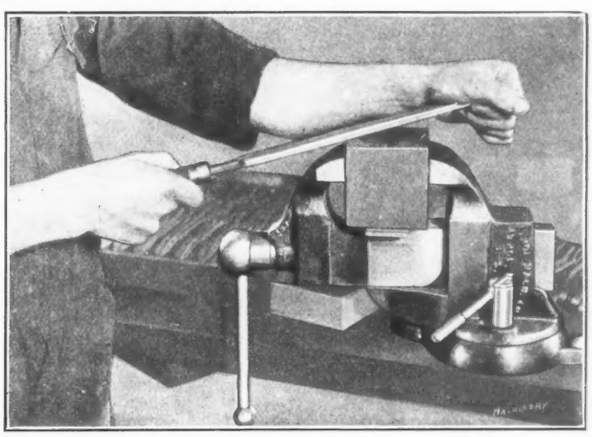

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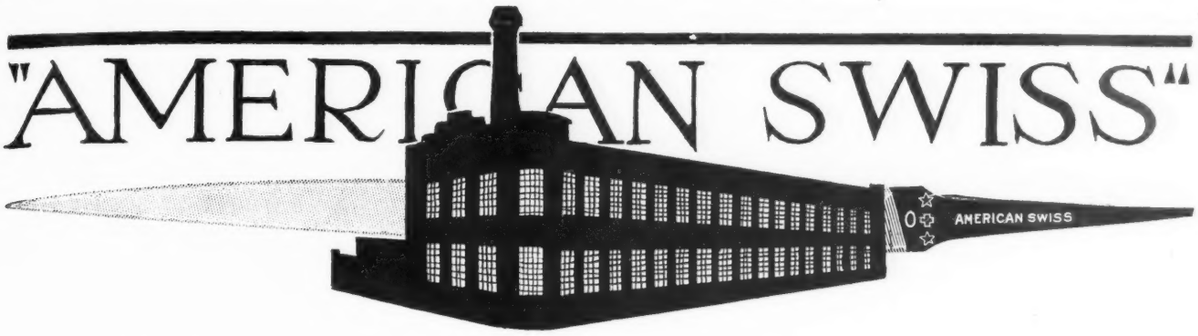

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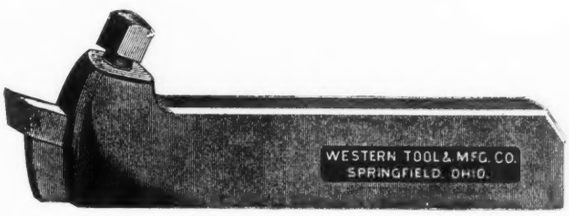

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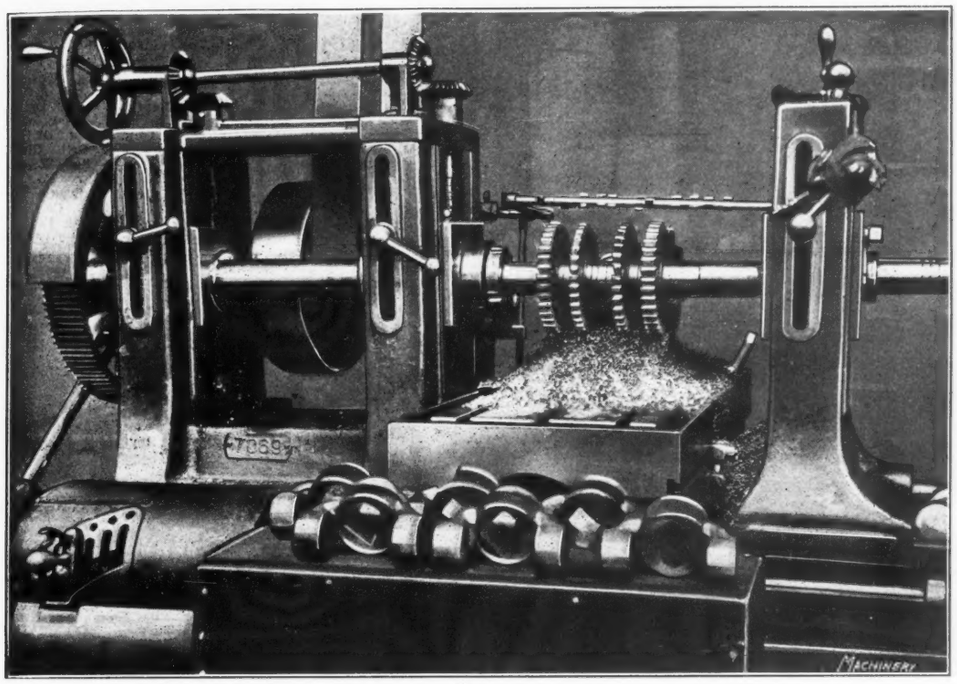

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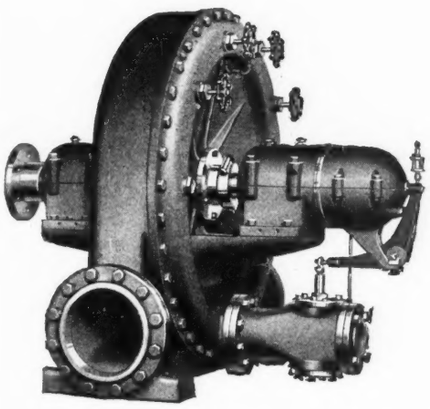

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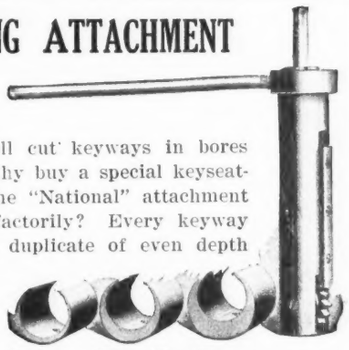

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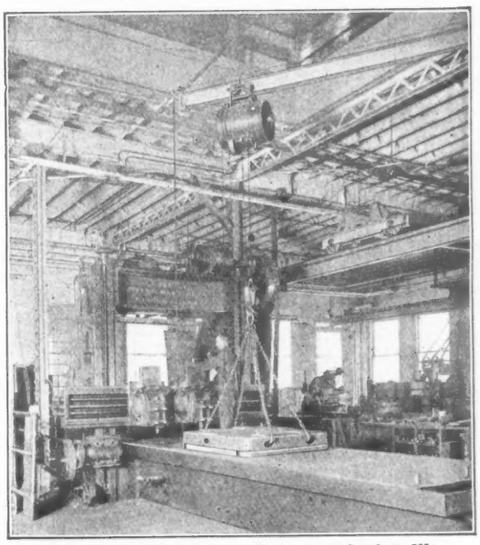

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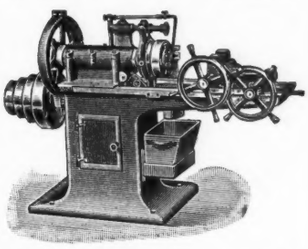

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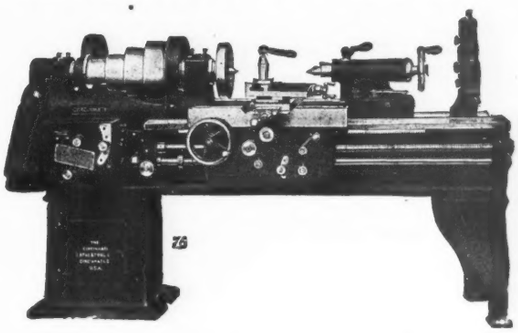

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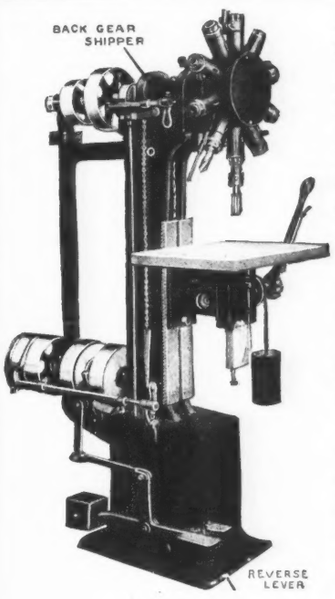

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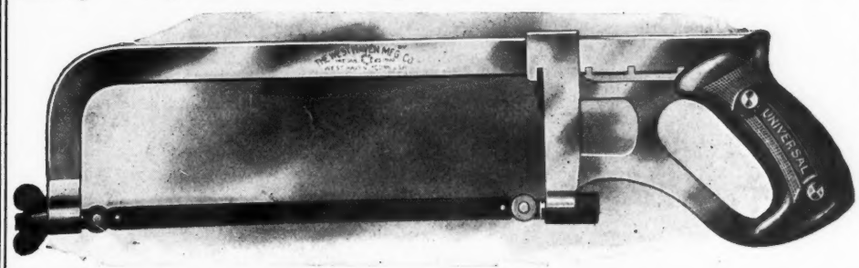

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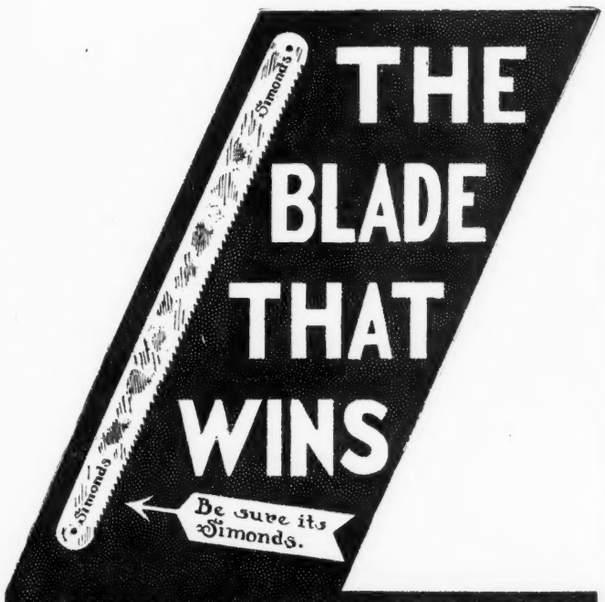

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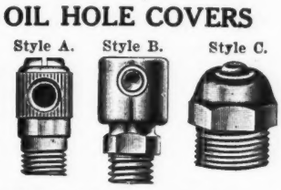

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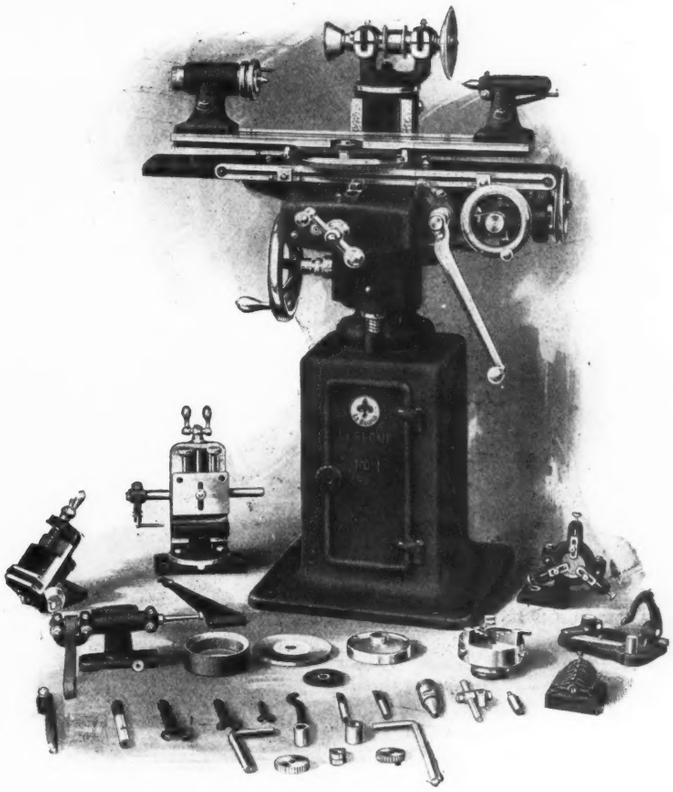

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A milling machine may possess all of the first three factors, but without **sharp and accurately ground cutters** its performance **cannot be satisfactory.**

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Cincinnati, Ohio, U. S. A.

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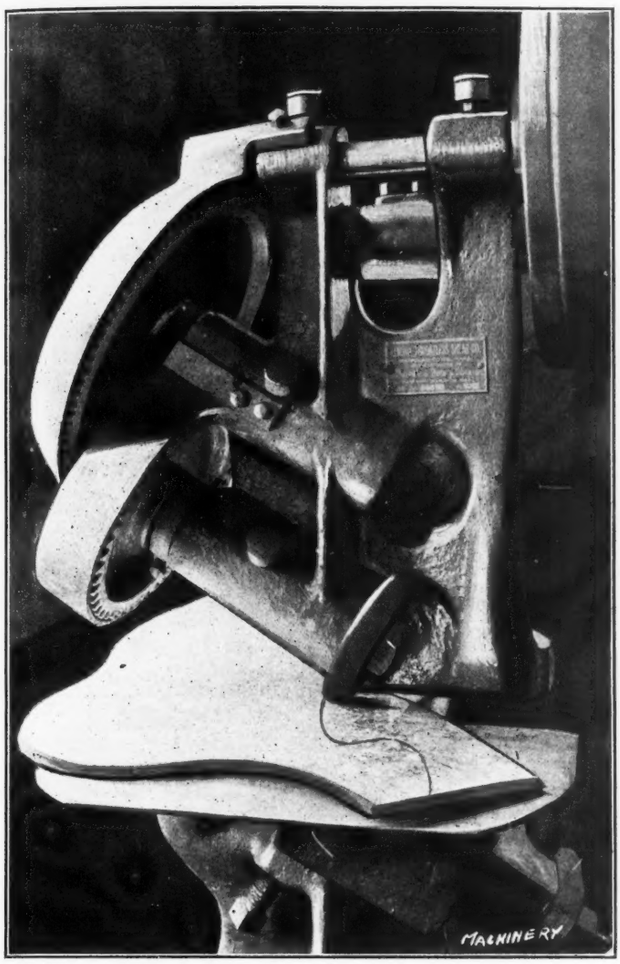


The LENNOX Throatless Shear Cuts Any Curve

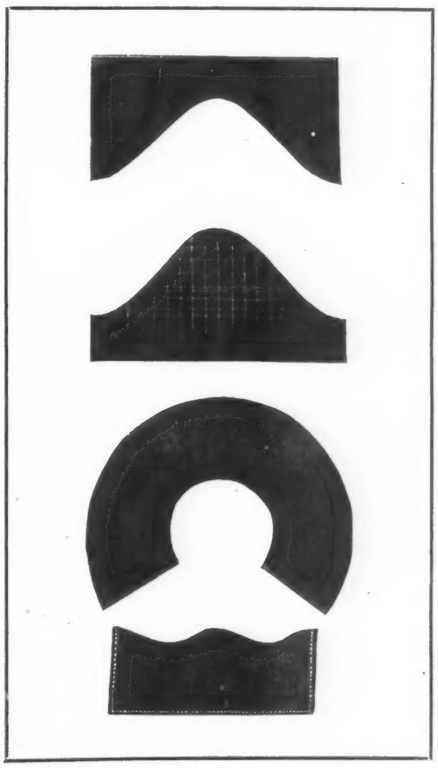
You know the faults of the ordinary irregular shear — how the tendency of the work to bind in the throat limits the range that can be cut and slows up production on forms that should be easy.

There's no such trouble with the Lennox Shear, for the very obvious reason that there is no throat. The so-called throat section is cut away in the form of a helix so that both halves of the sheared piece separate naturally and follow the helix out of the way. Practically any curve that can be drawn can be cut by this machine. See any advantage in capacity of this kind?

The work which the J. S. Thorne Company, Philadelphia, cut is particularly trying—sharp and complicated curves, steel up to ¼″ thick—and the "Lennox" is pronounced the "Best Shear in the Shop" by the superintendent. He ought to know a few things about shearing too, for he uses practically every machine made to handle this class of work.

Lennox Throatless Shears are built in five sizes, to cut 24 gauge to ½″ thick. The right size machine for the curves you cut will reduce costs fully 75 per cent.

We'll prove this if you let us.



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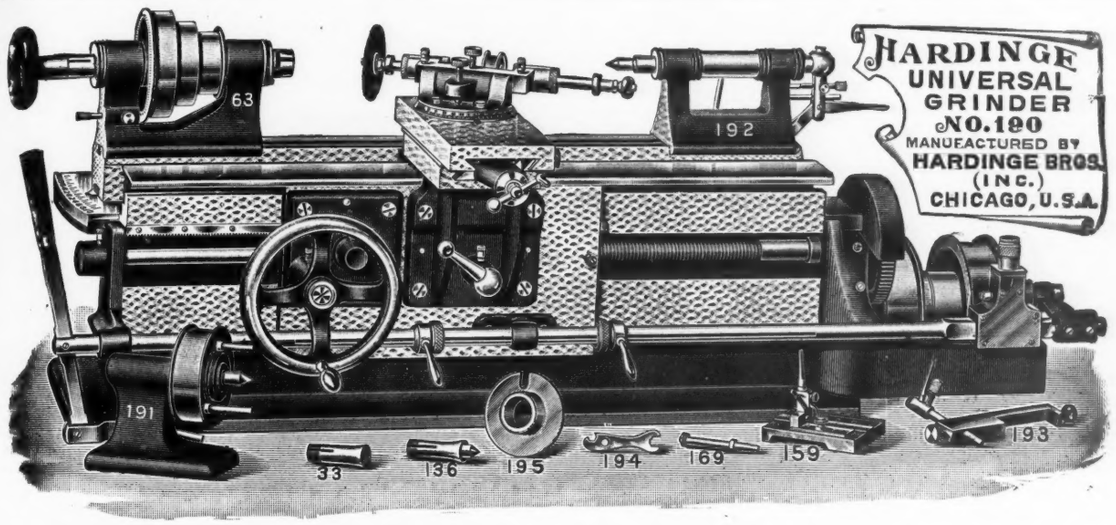

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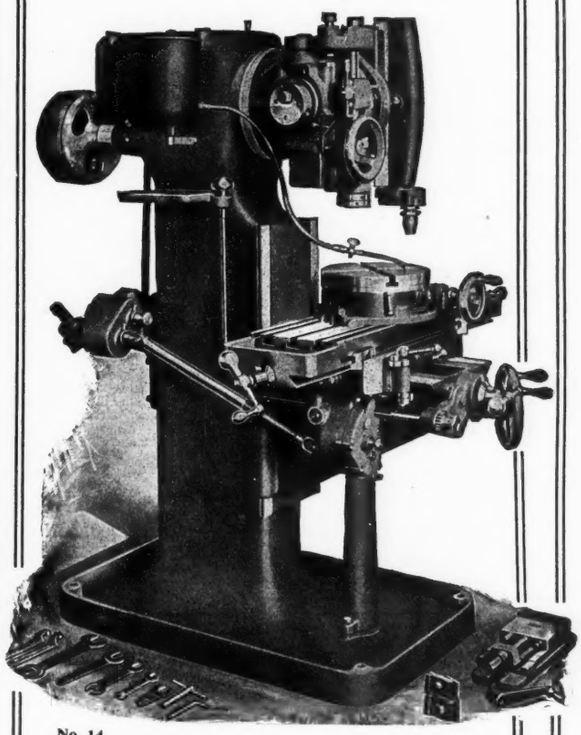

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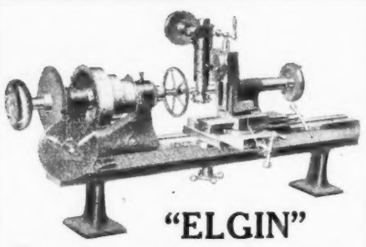

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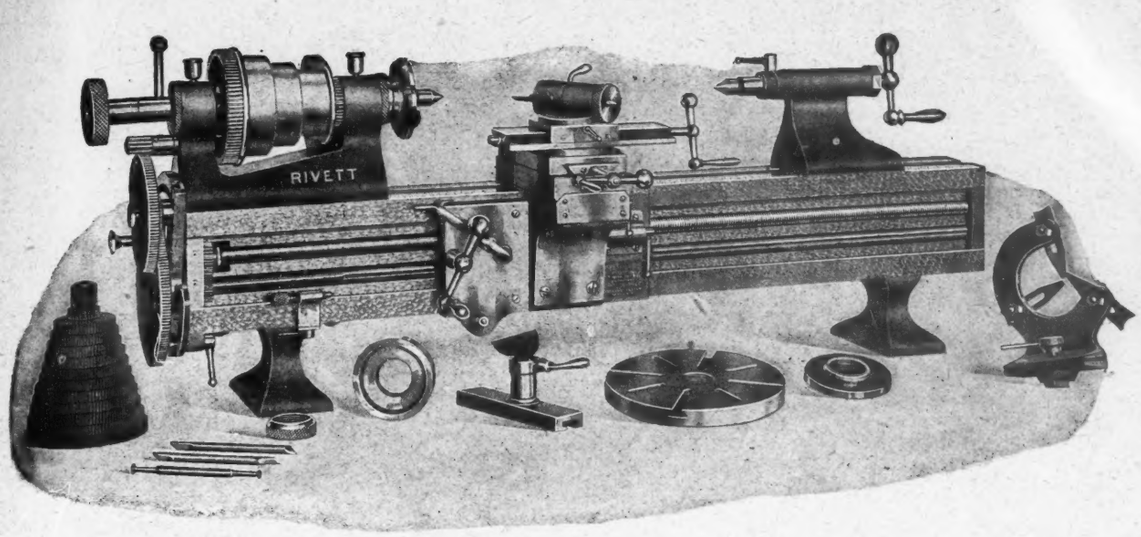

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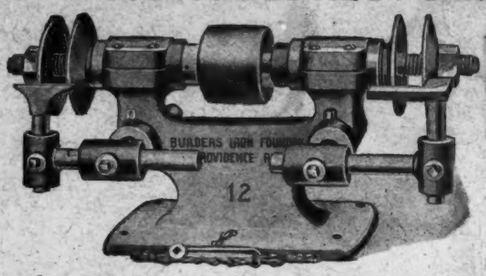

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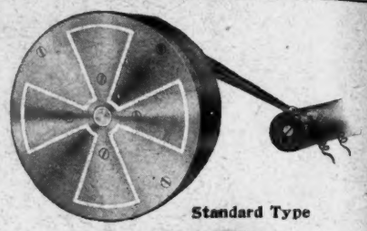

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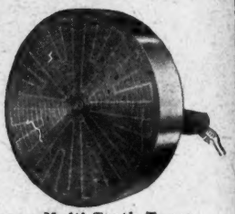

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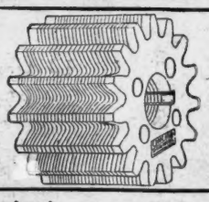

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